

General Standards

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This chapter discusses the general PTO standards for formal patent drawings for utility and design patent applications. Provisional patent applications, which are not examined by the PTO, can be submitted with informal drawings. See *Patent It Yourself* for details on provisional and regular patent applications, and Chapter 5 of this book for details on formal and informal drawings.

Although the drawings in existing patents are good examples of what proper drawings should look like, they cannot be entirely relied upon, because the drawing rules change from time to time, and improper drawings are sometimes allowed and printed due to oversights of the PTO. Therefore, inconsistencies between drawings in existing patents and the illustrations and rules in this book may be due to rule changes or the drawings in question being improperly allowed.

Paper, Margins, and Sheet Numbering

Paper used for black line drawings must be flexible, strong, white, smooth, not shiny, and durable. Only one side of the paper may be used.

Paper for Laser Output

For laser printer output from a CAD program (see Chapter 3 for details on CAD), use a good quality, white, smooth-surfaced laser printer paper of at least 20 lb., but preferably 24 lb. (Pound, or “lb.,” is a measure of paper thickness; an equivalent measure is called “sub,” or substance. The higher the number, the thicker the paper.) A smooth-surfaced paper will provide the sharpest lines. Such paper

is available at most stationery stores or large computer retailers. Avoid “computer paper”—the type with holes along the sides for dot matrix printers—and the lowest quality copier papers (less than 20 lb.), which are rough and thin.

Paper for Inkjet Output

For inkjet output, do not use laser printer paper, or even cheap “inkjet paper” (usually identified by the fact that it comes in 500 sheet reams) because these papers allow the ink to feather (spread out between the fibers of the paper). Specialty ink-jet papers must be used, such as the Epson line of high quality papers—the Photo Quality Inkjet Paper, Matte Paper Heavyweight or the Archival Matte. Avoid shiny paper. The PTO prefers paper that is not shiny.

Paper for Ink Drawings

For pen and ink drawings, Mylar film or vellum is preferable, but bristol board can be used. All of these provide a smooth finish that prevents feathering and are tough enough to withstand repeated erasing without damage. Such paper is generally available only at art supply stores.



CAUTION

Beware of translucent paper. Ink drawings made on vellum or Mylar film must be photocopied onto white paper, because vellum and Mylar film are translucent (semitransparent) and do not meet PTO standards, which require white, opaque paper. Use a copier in good condition and, if possible, clean its platen (glass), corona wires, and fuser rollers and vacuum its inside to ensure that the copies will be clean and free of specks.

Paper Size and Margins

All drawing sheets in an application must be the same size. Each sheet of paper must include an imaginary margin, free of any marks. Acceptable paper sizes and margins are shown in Illustration 8.1. The margin must be invisible; it cannot be framed by a rectangle. The dashed rectangles in the illustrations are there only for showing the imaginary margins; they must not appear in actual drawings. The usable portion of a sheet within the margins is known as the “sight.” Crosshairs, as shown in Illustration 8.2, should be placed at opposite corners of the sight to indicate its boundaries. The centers of the crosshairs should be centered on the corners, so that the outer arms of the crosshairs lie in the margins. The crosshairs can be placed on either the lower-left and upper-right or upper-left and lower-right corners, and should be about 2 cm ($\frac{3}{4}$ ") long.



TIP

Make sure the figures are positioned at least a few millimeters away from the margins, because the PTO sometimes complains of margin intrusions, even when the figures are clearly inside them. Keeping the figures well clear of the margins will avoid such a problem. (See Chapter 9 for additional details.)

Paper Orientation

A sheet of paper positioned so that it is taller than it is wide, such as those shown in Illustration 8.1, is said to be in “portrait” orientation. This is the preferred position. A sheet of paper positioned so that it is wider than it is tall, such as those shown in Illustration 8.3, is said to be in “landscape” orientation. Landscape orientation should be used only for long horizontal figures that cannot fit onto a sheet in portrait orientation without appearing too small. When

a sheet is oriented in the landscape mode, the sheet number should be on the right side and oriented as if the sheet were in the portrait mode. All other lettering and numbers on the sheet should be in the landscape mode, however. The top of a sheet in the landscape mode is the long side with the wider margin; see Illustration 8.3.



CAUTION

Avoid landscape orientation whenever possible. Do not use landscape orientation—that is, paper positioned so that it is wider than it is tall—unless it is absolutely necessary. This is because, at the PTO, the drawings are converted to computer files and associated with the same computer folder that also contains the written description (specification) of the invention, which is printed in portrait orientation. Therefore, drawings in landscape orientation force the examiner to turn his or her head or rotate the drawing images to view them upright, which can be irritating. And of course, you don’t want to irritate the examiner if you can avoid it!

Sheet Numbering

Your sheets of drawing paper must be numbered in consecutive Arabic numerals (the symbols 1, 2, 3, and 4), starting with 1. The required format is “sheet number/total number of sheets.” For example, if there are a total of four sheets, they should be numbered 1/4, 2/4, 3/4, and 4/4. No other marking—such as inventor name and title—may accompany the sheet numbers. However, the title of the invention, the inventors’ name(s), and a serial number, if it is a replacement drawing and already filed may be placed in the top margin, centered. As shown in Illustration 8.4, the sheet numbers must be placed on the top center of each sheet, below the imaginary top margin—that is, within the sight. If a drawing figure on

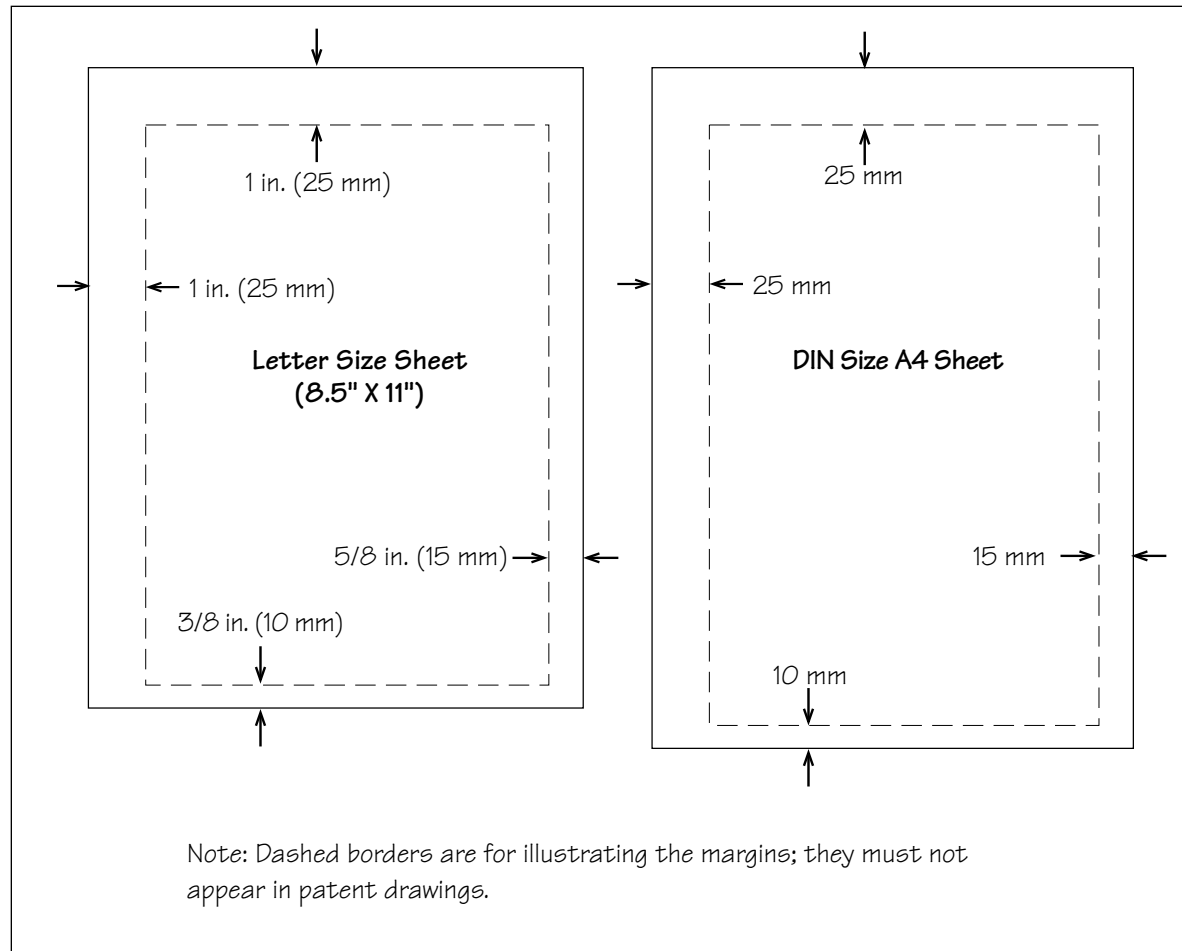


Illustration 8.1—Paper Size and Minimum Margins, Portrait (Preferred) Orientation

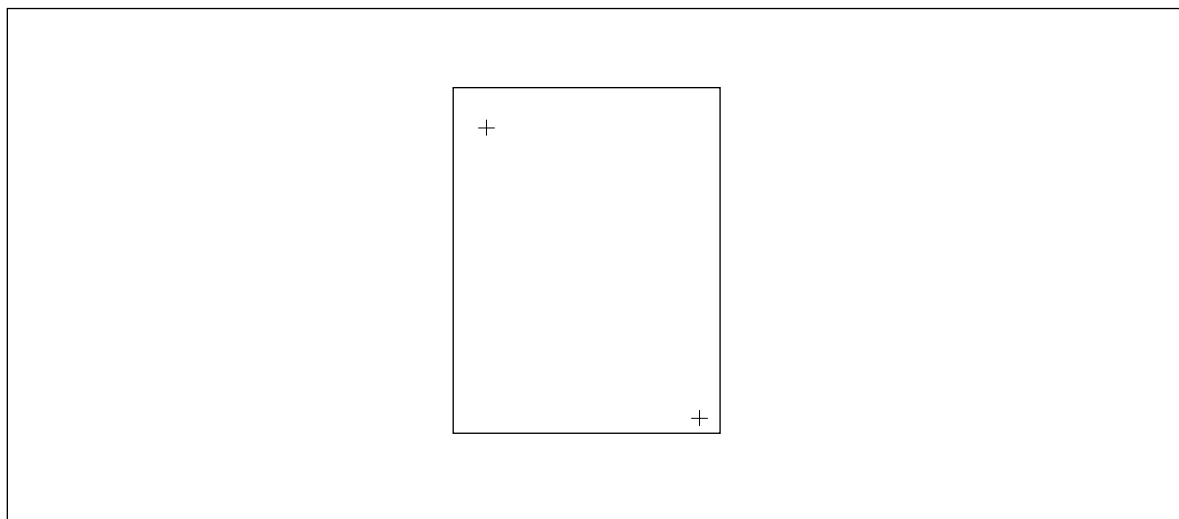
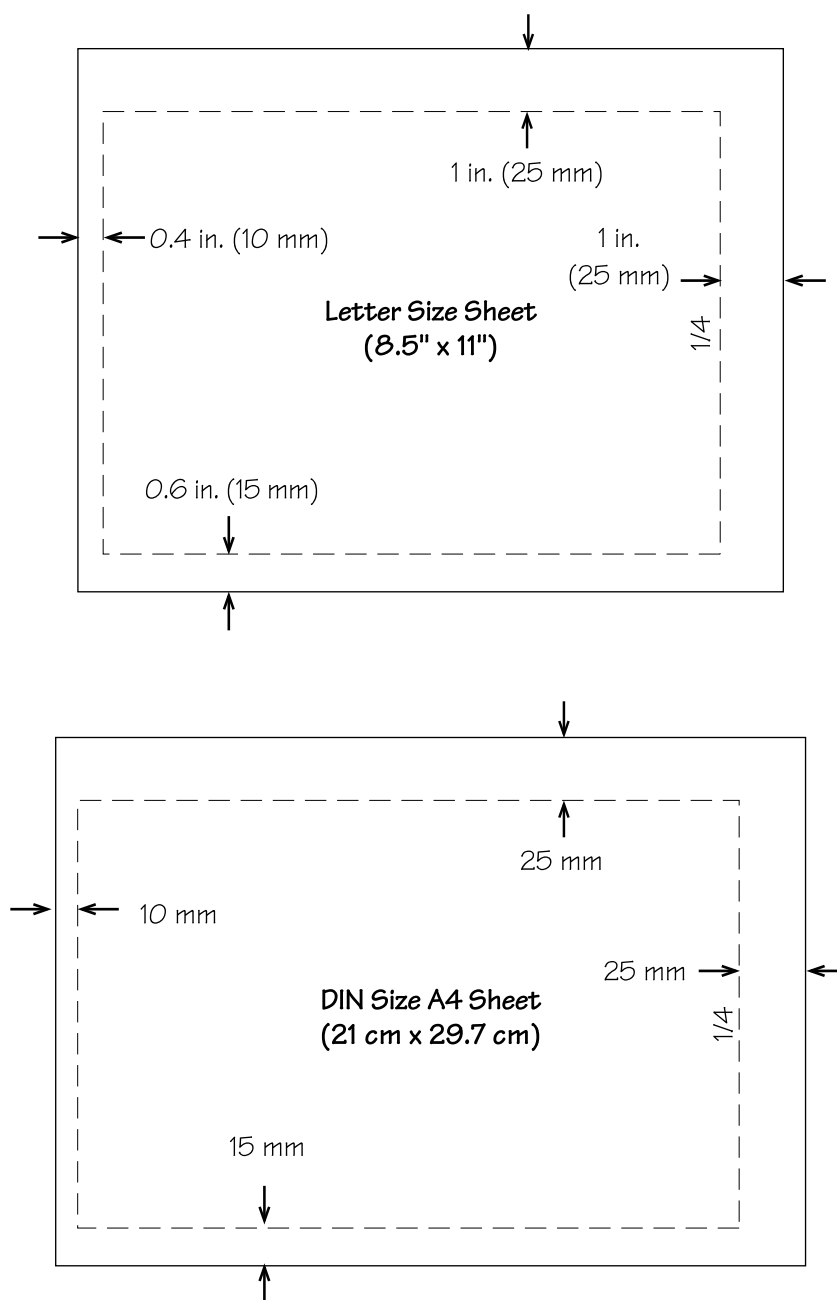


Illustration 8.2—Crosshairs



Note: Dashed borders are for illustrating the margins; they must not appear in patent drawings.

Illustration 8.3—Paper Size and Minimum Margins, Landscape Orientation

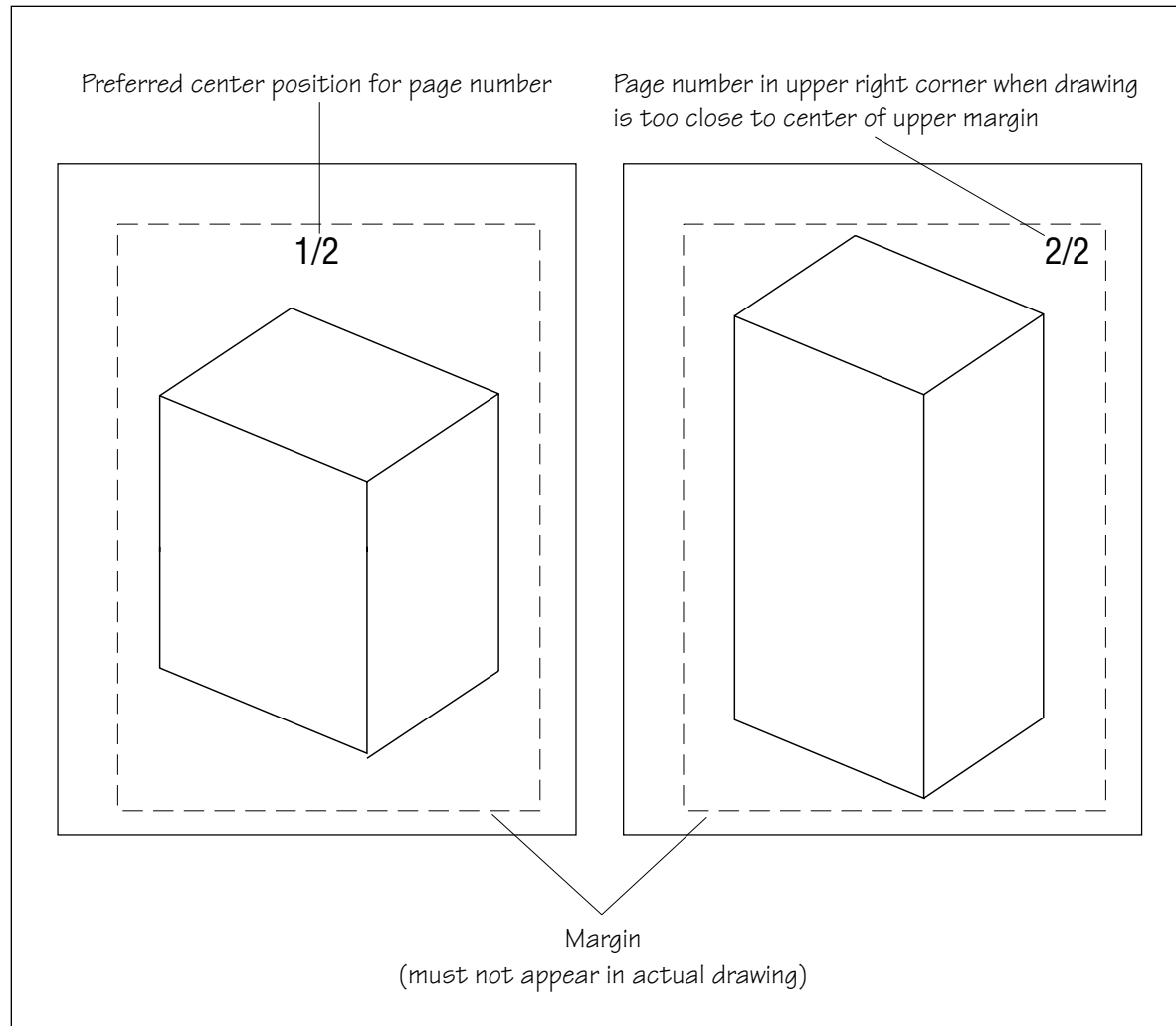


Illustration 8.4—Page Number Positioning

a sheet must be positioned very close to the top center of the sheet, where the sheet number would normally be, the sheet number may be placed at the upper-right corner of the sight. The sheet numbers must be larger in size than the reference numbers used to identify the parts of the figure—for example, about 5 mm, $\frac{1}{5}$ ", or 22 points in height.



TIP

As shown in Illustration 8.5, making page numbers, figure numbers, and reference numbers different sizes allows them to be more easily distinguished.

Clean Paper

The paper must not be creased or wrinkled, and must be reasonably free of dirty spots, erased lines that remain visible, and other alterations. If you submit photocopies, make sure that they are substantially free of the tiny copier marks or flecks that appear on many photocopies. If a few of these marks are present, you can use white correction fluid to cover them. Or, make new copies after cleaning the copier's glass surface, corona wires, fuser roller, and so on, very thoroughly.

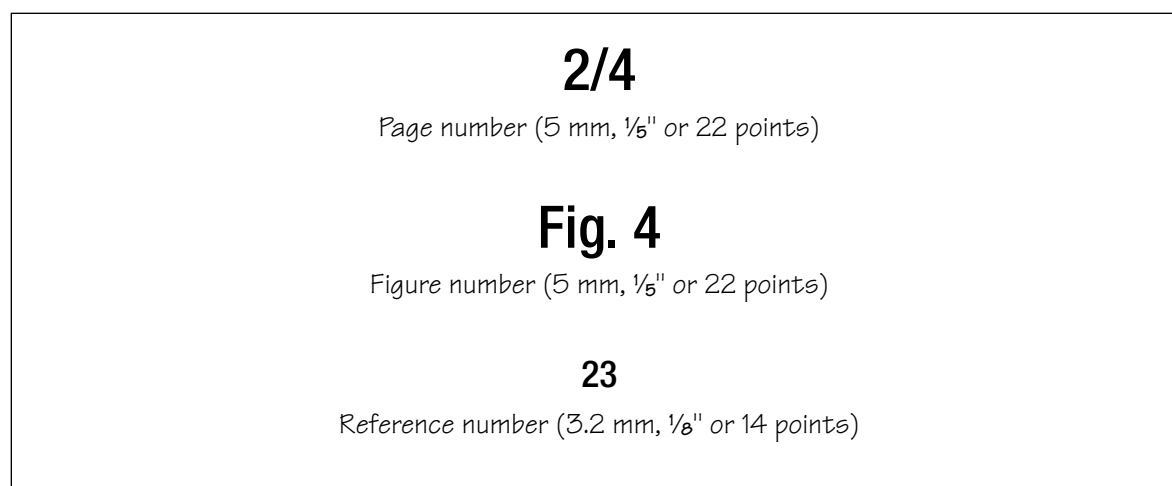


Illustration 8.5—Different Number Sizes

Mediums

Formal utility and design patent drawings should be black line drawings, but black-and-white photographs, color drawings, or color photographs may be used if necessary, as discussed below. Each type of drawing and the type of invention it is suitable for is discussed below. (See Chapter 5 for additional information on formal and informal drawings.) Plant patents are extremely rare, so they are not discussed here.

Black Line Drawings

Black line drawings on white paper are normally required for utility and design patent applications; they are suitable for illustrating the vast majority of inventions.

Black-and-White Photographs

Black-and-white photographs are accepted as formal drawings in utility and design patent applications only if the invention cannot be adequately illustrated with black line drawings (see Chapter 4). For utility applications, acceptable photographs include those for fine and irregular or natural structures and

microstructures, such as electrophoresis gels, blots, autoradiographs, cell cultures, histological tissue cross sections, animals, plants, in vivo imaging, thin-layer chromatography plates, and crystalline structures. For design applications, acceptable photographs include those that show subtle ornamental effects. No petition or fee is required for black-and-white photographs.

Color Drawings or Photographs

Color photos or drawings are accepted as formal drawings in utility and design patent applications if they are the only practical medium for illustrating the invention. They must be of sufficient quality to enable all the details to be clearly reproducible in black-and-white in the printed patent. A petition and a petition fee must accompany them. If the petition is not granted, formal black line drawings must be submitted to replace the color photo or drawings when the application is allowed. Color photos or drawings are approved only on rare occasions. The PTO discourages color photographs and drawings because they are difficult and expensive to reproduce. See Chapter 4 for details on the use of photographs as patent drawings.

Petitions for color photographs or color drawings are granted only if a very good reason is provided to explain why color is necessary. The requirements for submitting color drawings or color photographs as formal drawings are as follows:

- three sets of color drawings or color photographs; color photographs must be developed on double-weight photographic paper, or be permanently mounted on smooth cardboard, and be of sufficient clarity for reproduction.
- a petition (see Illustration 8.6 for a sample petition) that includes an explanation of why the color drawings or color photographs are necessary. (Use the tear-out Petition for Submitting Color Photographs or Drawings in the appendix.) A suitable explanation can read, for example, “The present invention comprises a mosaic assembly method for illustrating images from individual dots of respective colors. Thus it is necessary to provide drawings that show the individual dot colors and how they combine to form the desired image.”
- a petition fee (\$130 as of this writing), and
- the Brief Description of the Drawings section in the specification (written description of the invention) must contain the following passage as its first paragraph: “The file of this patent contains at least one drawing executed in color. Copies of this patent with color drawing(s) will be provided by the Patent and Trademark Office upon request and payment of the necessary fee.”

If the petition requesting to submit color drawings or color photographs is filed after the filing date of the application, so that the original specification does not include the above paragraph, a proposed amendment

must accompany the petition to insert the paragraph. (See *Patent It Yourself*, Chapter 13, for the procedure for amending an application.) The petition will be granted only if the PTO determines that a color drawing or color photograph is the only viable medium to adequately illustrate your invention.

If your petition for submitting a color drawing or photograph is granted, your patent will be printed with a black-and-white copy. The color drawing will be provided only upon request and payment of a fee, as stated in item four of the requirement above.

If your petition for submitting color drawings or color photographs is denied, the examiner will object to the drawings as being improper and require you to either cancel the color photograph or drawing or provide substitute black line drawings. However, canceling the photo or drawing may not be an option, because the remaining drawings, if any, may not be adequate to allow comprehension of your invention. If this is the case, you must provide substitute black line drawings instead. See Chapter 3 for details on converting photographs into black line drawings.

EXAMPLE:

Gladys files an application with three color drawings. Her petition for submitting the color drawings was denied. She cannot cancel the drawings, because the invention cannot be understood with the written description alone. In this situation, she must replace the color drawings with black line drawings. The black line drawings may not contain any details that were not in the color drawings.

Illustration 8.6—Sample Petition for Submitting Color Photographs or Drawings

Arrangement and Numbering of Figures

The drawings must be arranged and numbered in particular ways, as discussed below.

Arrangement of Figures

The drawings must be on sheets that are separate from the written description in the patent specification. The only exceptions are formulas and tables, which may either be submitted as drawings on separate sheets, or be incorporated into the written description as textual information. See Chapter 6 for details on formulas and tables.

Each sheet of paper may contain several drawing figures, also known as views, as shown in Illustration 8.7. Each figure should be shown upright with respect to the top of the paper, depending on whether the paper is in portrait or landscape orientation. The figures must also be far enough apart to be clearly separated, so as to avoid confusion. Separate figures must not be connected by construction lines (dashed lines showing how the parts fit together). An exception to this rule is made for electrical waveforms, which may be connected by dashed lines to show relative timing, as shown in Chapter 6, Illustration 6.43.



TIP

Bigger is clearer. Make full use of all the available space on the paper to make the figures as large as possible. If an object must be drawn so large to show its details that there is no room for another figure, use additional sheets for the other figures. Never crowd the figures. The PTO's fees are the same regardless of the number of drawing sheets in an application.

Numbering of Figures

All figures must be numbered in consecutive Arabic numerals (the symbols 1, 2, 3, and 4), starting with 1. The figures should preferably be arranged on the sheets so that the lowest numbered views appear on the first sheet, and progress through the sheets as the figure numbers rise. The first figure number of a sheet should continue from the last figure number of a previous sheet, and must not restart from 1 on each sheet. For example, the first sheet may contain Figures 1, 2, and 3; the second sheet may contain Figures 4 and 5; the third sheet may contain Figures 6, 7, and 8; and so on. However, if this is not practical, due to figure sizes, the figures may be arranged out of order on the sheets. The figures on each sheet are preferably, but not necessarily, numbered so that they progress from top to bottom, as shown in Illustration 8.7.

The figure numbers must be preceded by “FIG.” or “Fig.”—for example, “Fig. 3.” Figure numbers may include letter suffixes, such as “Fig. 1A” and “Fig. 1B.” However, it is good practice to reserve letter suffixes only for partial views or different views of one embodiment. Each figure number must refer only to a single figure. For example, it is improper to number a sheet “Fig. 3,” and number each figure “Fig. 3A,” “Fig. 3B,” and “Fig. 3C,” because “Fig. 3” does not refer to a specific figure. In such a case, just leave out “Fig. 3.”

Numbering of Partial Figures

If a figure is so large and complex that its details are too small if it is made to fit on one sheet, it can be spread across several sheets, as shown in Illustration 8.8. The figure must be arranged on each sheet so that the sheets can be tiled next to each other to assemble the complete figure. A dot-dot-dash line should

1/4

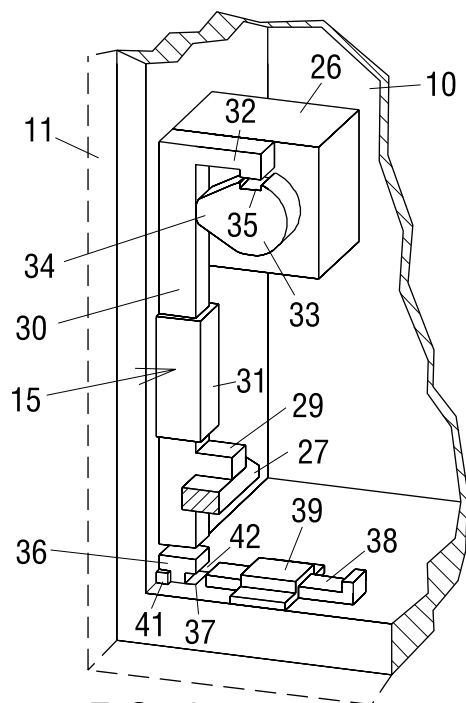


FIG. 1

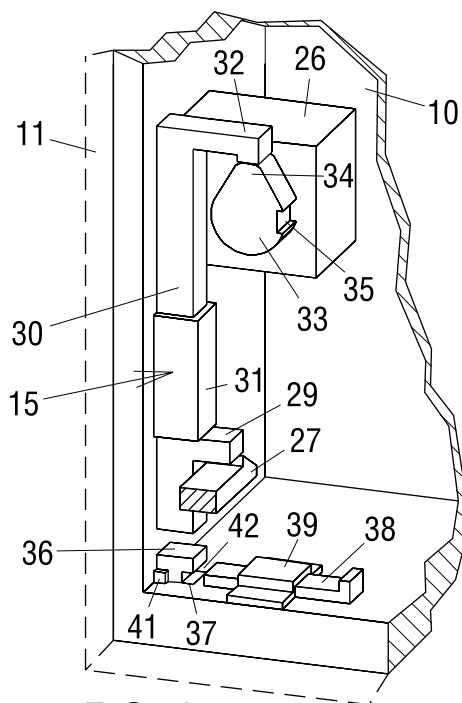


FIG. 2

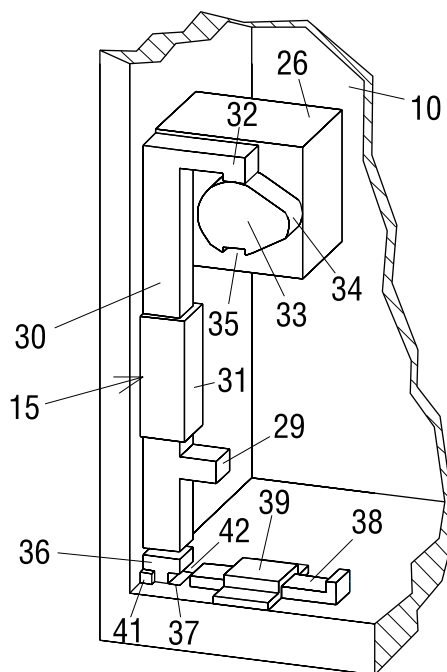


FIG. 3

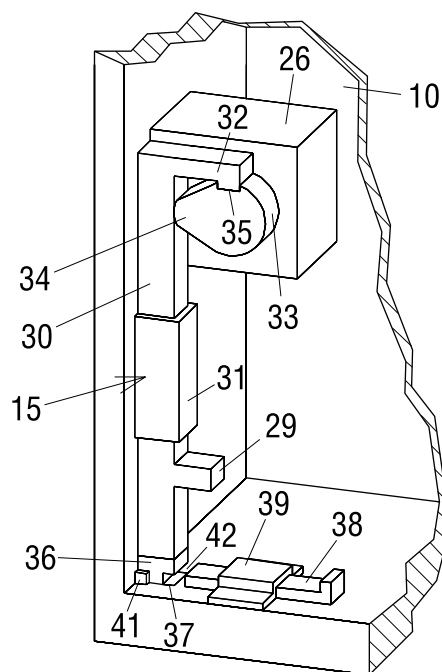


FIG. 4

Illustration 8.7—Arrangement of Figures

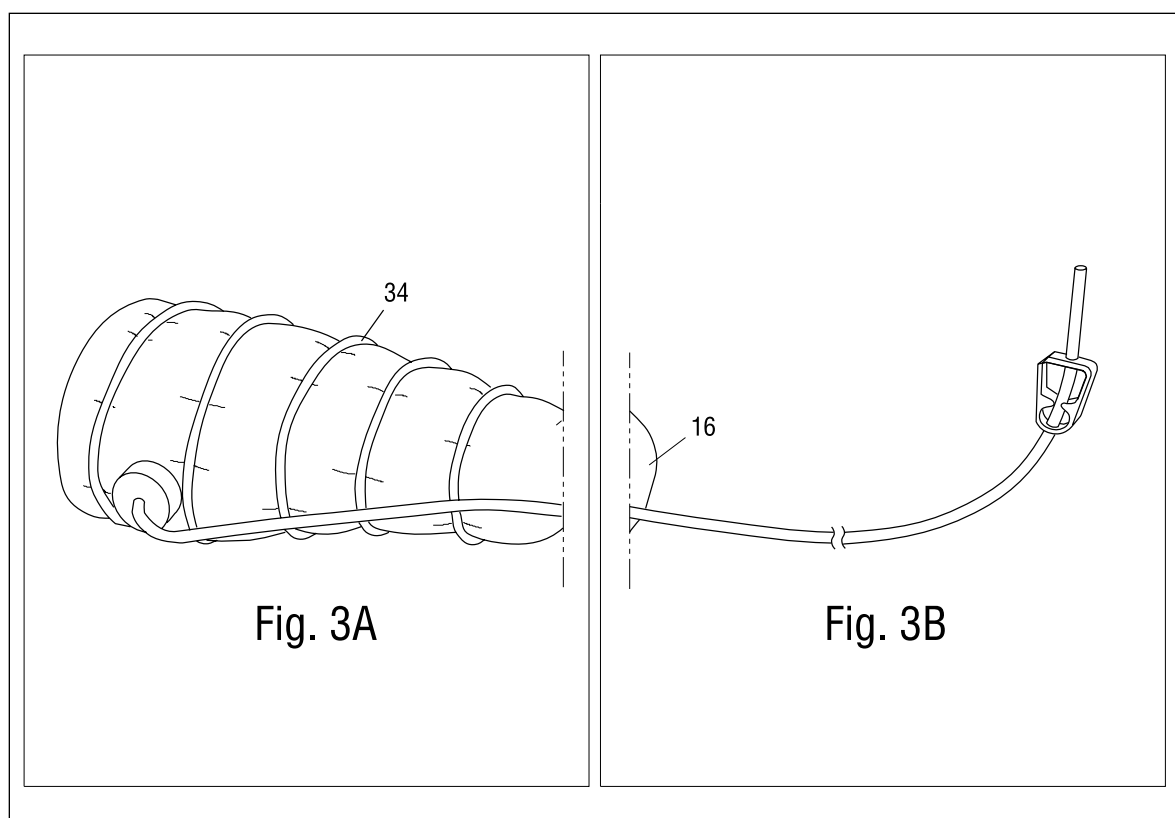


Illustration 8.8—Spreading a Large Figure Onto Multiple Sheets

be provided to denote the broken edge of each partial figure. Any arrangement of the sheets can be used—for example, side-to-side, top-to-bottom, and rectangular array as long as the sheets can be assembled without ambiguity. Each partial figure should be labeled with the same figure number having a different letter suffix, for example, Fig. 2A and Fig. 2B.

Number Size and Style

A simple, easy-to-read lettering style or font should be used, as shown in Illustration 8.9. The ornate type of lettering typically used for the word “Fig.” and the figure number in very old patents should be avoided. The figure numbers must be larger in size than the reference numbers to distinguish them. For

example, the figure numbers should be about 5 mm, 1/5", or 22 points in height.

When a Bracket Is Necessary

If a figure includes any elements that are not connected, such as in the exploded view of Illustration 8.10, a bracket must be used to “embrace” the disconnected element to indicate that it is part of the same figure.

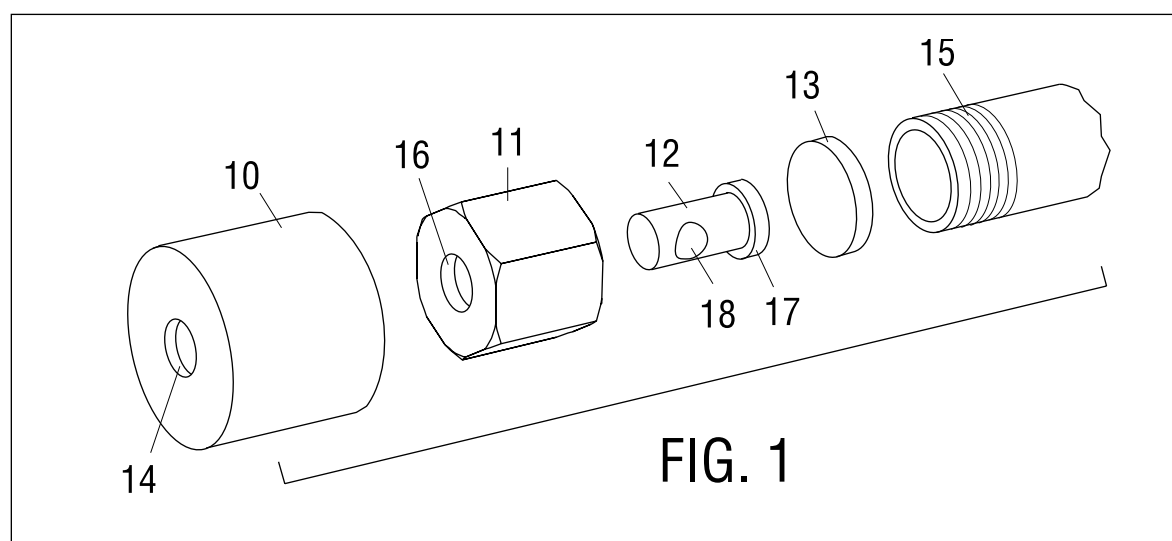
Even if a figure is not an exploded view, but it includes a part that is disconnected from the rest of the figure, a bracket must be used (as in Illustration 8.11). However, if an exploded view—or any figure with disconnected parts—is the only figure on a sheet, no bracket is needed, because every element would clearly belong to the same figure.

Fig. 2

Undesirable: Ornate Lettering Style or Font

Fig. 2

Preferable: Simple Lettering Style or Font

Illustration 8.9—Figure Number Lettering Style or Font**Illustration 8.10—Bracket in Exploded View**

Application With Single Figure

If an application includes only one figure, do not give it a figure number. The sheet number is still necessary, though, and should be “1/1.”

Figure Depicting Prior Art

The written description of a utility patent application must include background information, such as a discussion of any relevant prior art (older inventions) of which you are aware. It is usually not necessary to make a drawing

of any prior art. If you do, such figures must be numbered in the conventional manner in sequence with the rest of the figures, and the label “Prior Art” must be added next to or below the figure number, such as in Illustration 8.12.

Reference Numbers

Each part or element of a utility patent drawing mentioned in the written description must be designated by a reference number or letter,

although numbers are preferred. They may start with any number and do not have to be consecutive. Design patent drawings must not include reference numbers or letters.

Reference numbers mentioned in the description of the invention in the specification must appear in the drawings, and reference numbers that appear in the drawings must be mentioned in the description. That is, each number must appear in both the specification and the drawings. Let's take a very simple description as an example: "As shown in Fig. 1, a chair includes a seating surface 10; supporting legs 11, 12, 13, and 14; and a seat back 15." For simplicity, consider it to be the entire description in the application. The same reference numbers, which include 10, 11, 12, 13, 14, and 15, must all be shown in the drawings.

Different Parts Must Have Different Numbers

Each designated component of the invention must have a unique reference number—that is, the same number must not be used to designate different parts of the invention. If the same part appears in separate figures, it must be designated with the same number. For simplicity, the same number may be used to designate separate but identical parts, such as bolts. However, if such parts are referred to separately, different numbers should be used to avoid confusion. For example, "A bolt 13 is removable from the top end of a connecting rod 14, while bolts 15 are permanently attached to the lower end of connecting rod 14."



CAUTION

Keep your parts and numbers straight.

Using different numbers for the same part in different figures, or using the same number for different parts, are two of the most common mistakes.

Proofread the description and drawings carefully to weed out such errors.

Consecutive Numbers Are Preferable

There is no PTO requirement for reference numbers to appear in any particular order in the written description (specification). Nevertheless, consecutive numbers (for example, 10, 11, 12, and 13), or consecutive odd or even numbers (for example, 11, 13, 15, and 17, or 10, 12, 14, and 16), are preferable, because they are easier for a reader to follow than random numbers that do not follow a logical sequence (for example, 24, 12, 43, 11, and 33). Also, the numbers customarily start with at least 10, or a higher number than the highest figure number, to avoid confusion with the figure numbers. Using every other number, as suggested in *Patent It Yourself*, allows intermediate numbers to be added later, and still maintain the sequence. For example, if after writing much of the specification, you want to number a washer mentioned between a bolt 16 and a nut 18, you can give it the number 17. However, if you used consecutive numbers, and need to add a number, simply use the next higher number or a suffix (16A); don't worry about renumbering everything.

Reference Letters

Instead of reference numbers, suitable letters may be—but are not necessarily—used for designating nontangible elements, such as "A" for air flow, and should preferably be of the English alphabet. Letters may also be used where they are customarily used, such as in electronics. For example, "R1" and "R2" may be used for designating resistors; "C1" and "C2" may be used for designating capacitors; and so on.

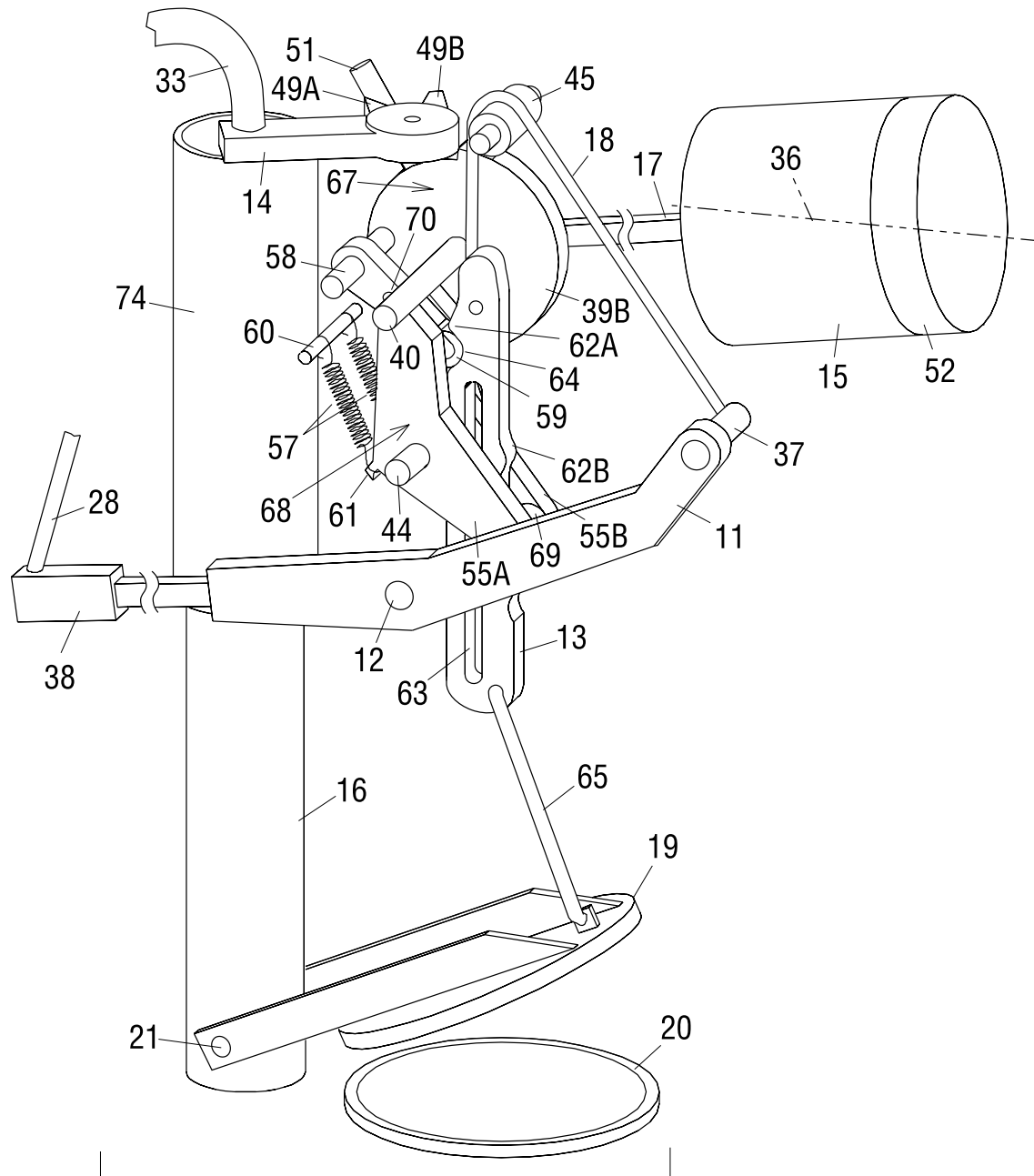


FIG. 3A

Illustration 8.11—Use of Bracket

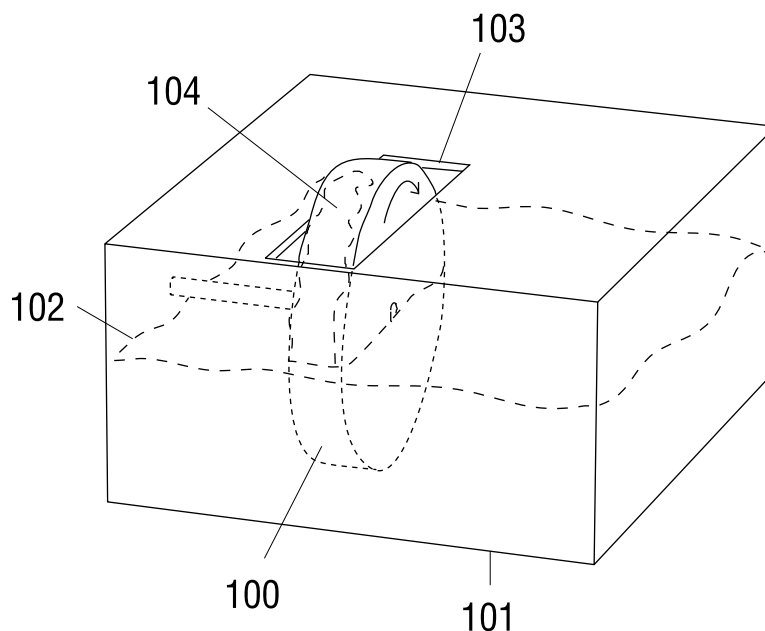


Fig. 1
Prior Art

Illustration 8.12—“Prior Art” Label

Non-English Letters

Non-English letters are allowed where there is customary usage. For example, Greek letters may be used to indicate mathematical and scientific values in formulas and the labels of graphs, and they may also be used as reference characters in drawings. However, we recommend that you use Latin letters if at all possible, since your examiner or judge may not be familiar with Greek letters.

Primed Numbers

Primed numbers or characters—that is, numbers with a mark (') to their upper right—

for example, 23' and 23'—are not specifically prohibited, but they should be avoided because they tend to be confusing.

Letter Suffixes

Reference numbers with letter suffixes may be used if the letter suffix helps explain the part, for example “left wheel 12L and right wheel 12R” or “upper surface 14U and lower surface 14L.”

Number Size and Style

Reference numbers or letters must be of a simple lettering style or font and at least 3.2

mm, 1/8" or 12 points in height, as shown in Illustration 8.13. Avoid the very ornate type of lettering used in some old patents. Do not make the reference numbers larger than the required size, otherwise they take up too much room and may make the sheet too crowded for easy reading or may not fit into small spaces. To further save space, use a thin, horizontally compact style or font, which is typically called “condensed.”

An exception to the size requirement is that subscripts, such as the “2” in the chemical formula “CO₂,” may be smaller than 3.2 mm.

**TIP**

When drawing with a computer-aided drafting (CAD) program, select the font before applying the reference numbers. This is because if you change the font after the numbers are applied, they will shift position and will no longer line up properly with the lead lines. The amount of shifting depends on the fonts used before and after the change.

**TIP**

A keystroke saver. Some CAD programs require the font height to be typed in every time the program is used, so frequently typing in “3.2” gets tiresome. It is more convenient to type in just “3”; a 3 mm font is virtually indistinguishable from a 3.2 mm font, so that it is perfectly acceptable.

Size of Descriptive Text

In addition to reference numbers and letters, the size requirement applies to all characters, including lowercase letters, used in any descriptive text in the drawings. As stated, all letters must be at least 3.2 mm high. If descriptive text is written in sentence case, such as “Electrical power supply,” or title case, such as “Electrical Power Supply,” and the shortest lowercase letters must be at least 3.2 mm high, then the uppercase letters will be even taller and take up too much room. Therefore, it is usually best to use all capital letters, such as “ELECTRICAL POWER SUPPLY,” so that no letter is over 3.2 mm tall.

53

Undesirable: Ornate number style or font

53

Better: Simple number style or font, but too thick and wide

53

Preferable: Simple number style or font

Illustration 8.13—Reference Number Style or Font

Reference Number Positioning

Reference numbers or letters should be positioned a short distance away from the part they are designating, and far enough from other parts and from each other to avoid confusion, as shown in Illustration 8.14. They are preferably positioned outside the figure to avoid cluttering it, but they may be positioned inside if necessary to avoid being too far away. They must never be positioned across any lines of the figure, including hatch lines.

Reference Numbers Between Different Embodiments

In an application with multiple embodiments or variations that share common parts, the same reference numbers can be used for the common parts between the embodiments. For example, two embodiments of a hand pump include the same pump cylinder, but different handles. The identical pump cylinders may be designated with the same reference number in all the figures—for example, “10”—but the handles must be designated with different numbers, such as “11” in the figure of the first embodiment, and “12” in the figure of the second embodiment.

Lead Lines

A lead line must extend between each reference number and its corresponding part. One end of the lead line should be very close to the reference number without touching it, and the other end must touch the part of the figure being designated, such as in Illustration 8.15. Lead lines must never cross each other.

Either Straight or Curved Lines

Lead lines may be straight or curved; a drawing can include both types if you wish. Although straight lines are easier to draw, curved ones can be more easily positioned in tight places, as shown in Illustration 8.15. They should not be too long—that is, the reference numeral should not be positioned unnecessarily far away from the part so as to require a long lead line. They should be positioned at a large angle from adjacent lines of the figure to avoid being confused as lines of the figure. They may cross lines of the figure, but should be positioned so as to cross as few lines as possible to avoid confusion.

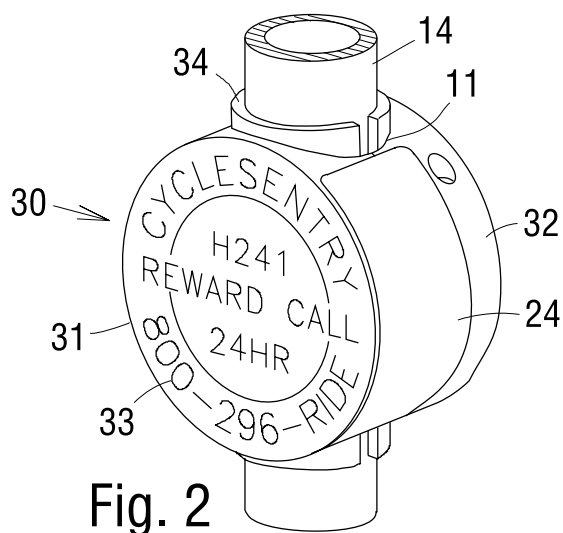


TIP

For best appearance, a lead line should be aligned with the imaginary center of the reference number, as shown in Illustration 8.16. The dashed line is solely for showing alignment; it should not appear in the drawing.

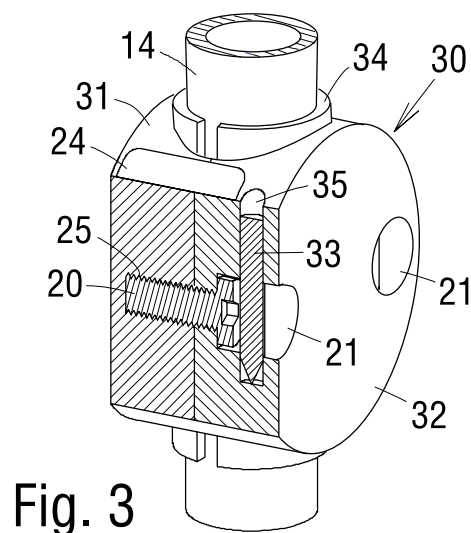
Correct

Numbers positioned outside figure



Correct

Some numbers positioned inside figure without crossing lines of figure



Incorrect

Numbers positioned over lines of figure

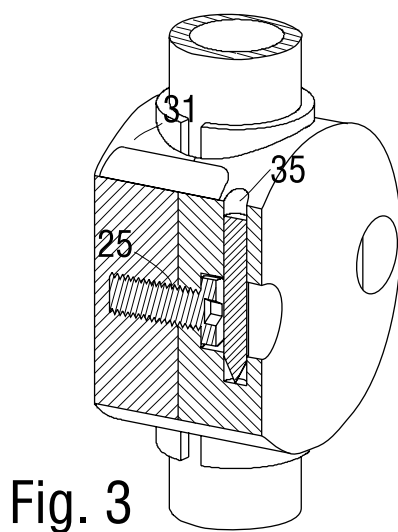


Illustration 8.14—Reference Number Positioning

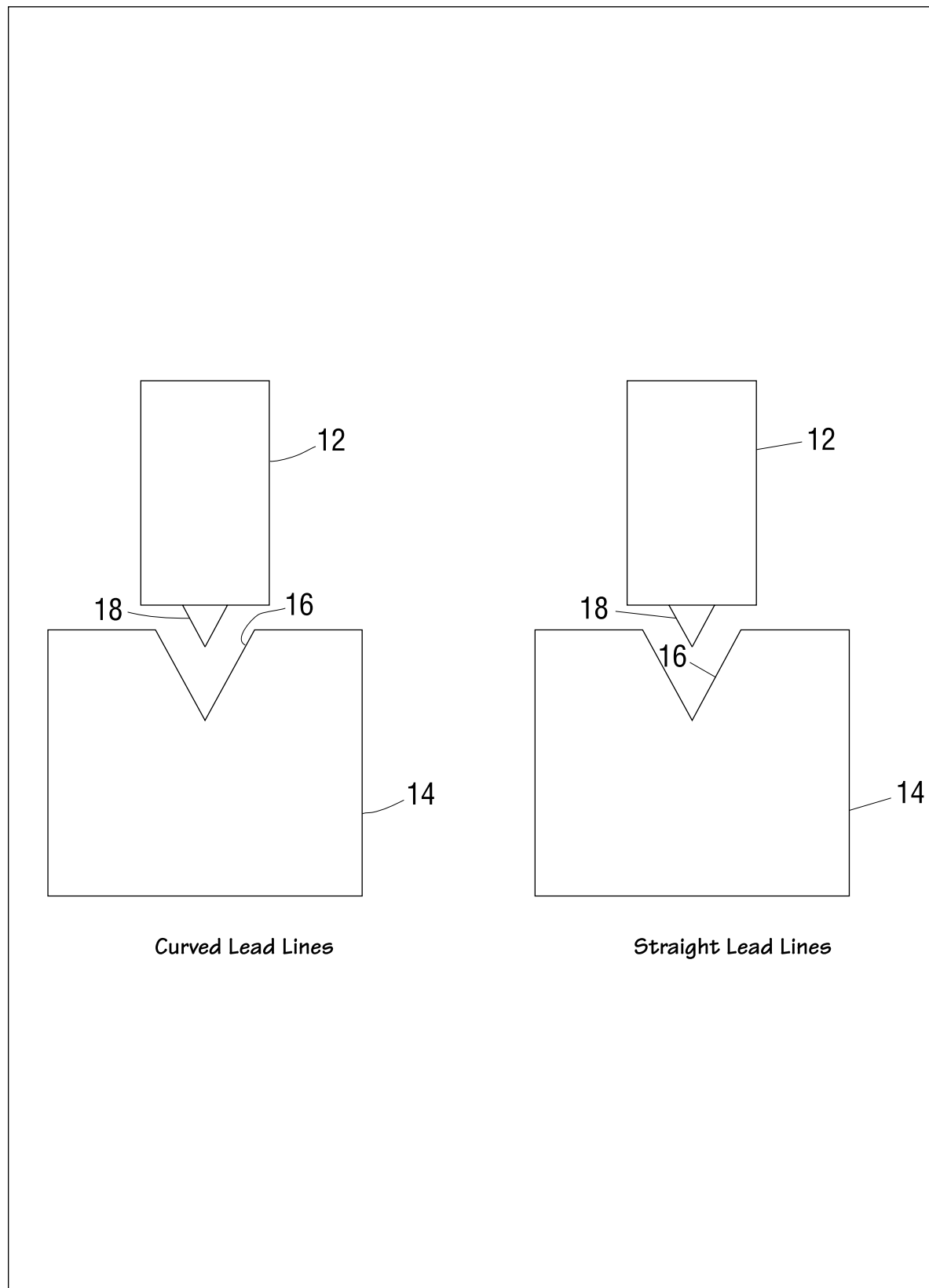


Illustration 8.15—Lead Lines

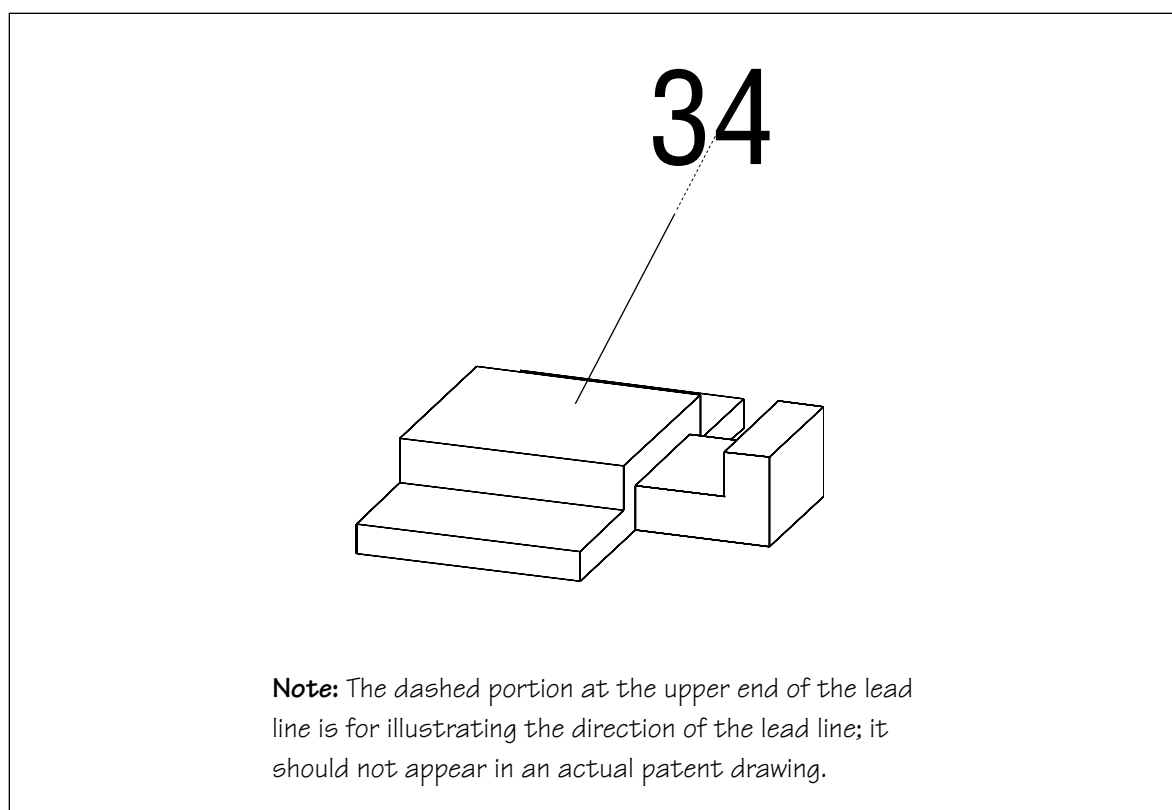


Illustration 8.16—Lead Line Positioning

Lead Lines Must Not Connect Separate Figures

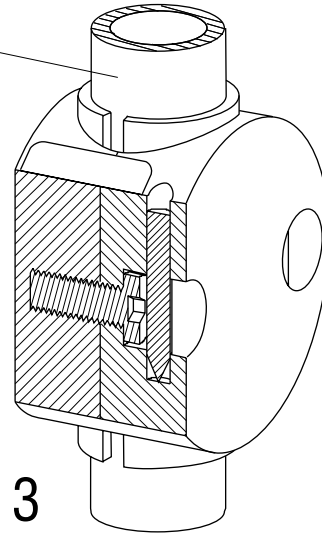
If an identical part appears in separate figures, it must not be referenced by a single reference numeral with two lead lines. In Illustration 8.17, a badge is shown in different views in Figs. 2 and 3. The top two illustrations show the incorrect usage of lead lines: The pipes in each figure are connected to the same reference number (14) positioned between the figures. The figures are thus considered to be “connected” by the lead lines, which is improper. The bottom two illustrations show the correct usage of lead lines: The pipes in each figure are connected to their own reference numbers, so that the figures are not connected.

Replacing Lead Lines With Underline

If a reference number lies on a surface or cross section it is meant to designate, the lead line may be replaced with an underline for the number, such as parts 11 and 12 in Illustration 8.18. In fact, part 10 may also be underlined instead of being connected with a lead line. This method may be advantageous in some situations where space is limited. The hatching in the cross section must be interrupted to allow space for the number. However, this type of numbering may be confusing, so it should be used sparingly.

Incorrect

Lead lines connecting separate figures to one reference number



Correct

Lead lines connecting each figure to separate reference numbers

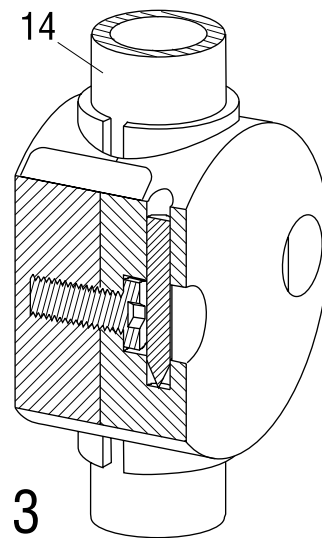


Illustration 8.17—Lead Lines Must Not Connect Separate Figures

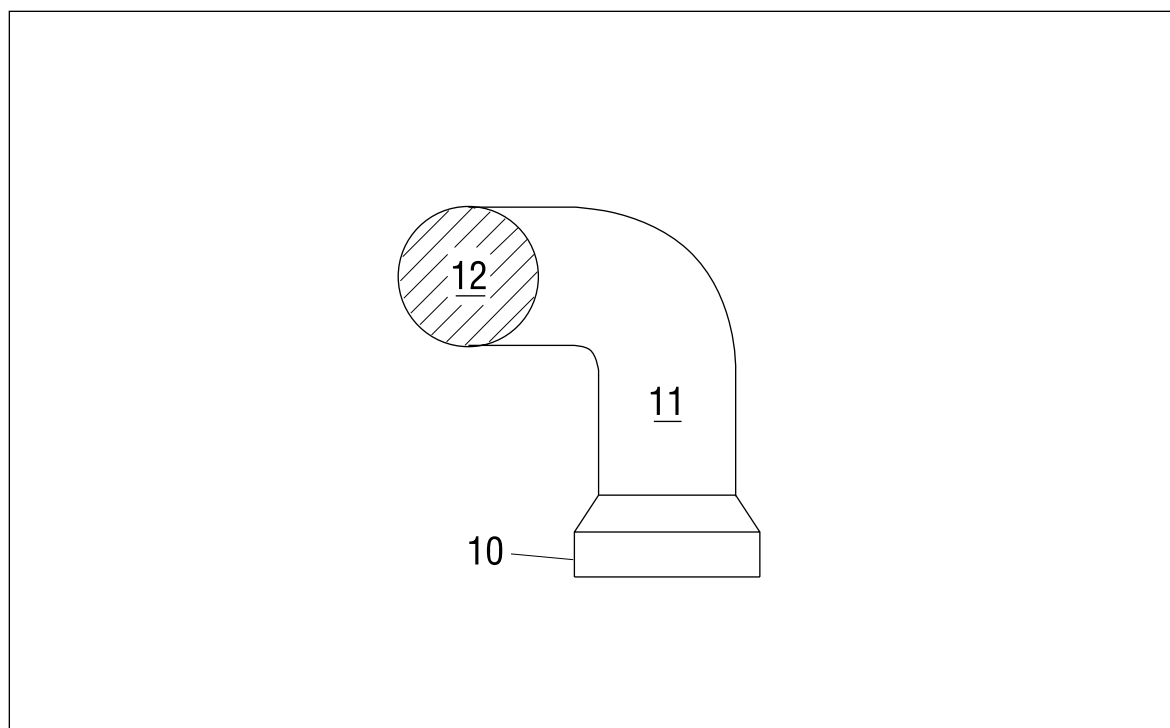


Illustration 8.18—Underlined Reference Numbers

Arrows

Arrows should not be used on drawings except in the following situations:

- to designate a group of parts with a single number, even if each part has its own number, as shown in Illustration 8.19. The arrow should point in the general direction of the group. In the illustration shown, parts 17, 39, 41, 42, and 51 are collectively designated as an assembly 67; and parts 43, 44, 55, and 66 are collectively designated as an assembly 68 (the term “assembly” is chosen arbitrarily). The specification should describe the assembly as including such-and-such constituent parts—for example, “A cam assembly 67 includes arms 17 and 51, a disc 41....”
- to indicate the plane and direction of a sectional view (see Chapter 6 for details), and
- to show the direction of movement, as shown in Illustration 8.20. The purpose of such an arrow should be mentioned in the specification—for example, “a hinged arm 12 pivoting in the direction indicated by the arrow.” If there is more than one arrow in a figure, each arrow should be designated with a different reference number to avoid confusion.

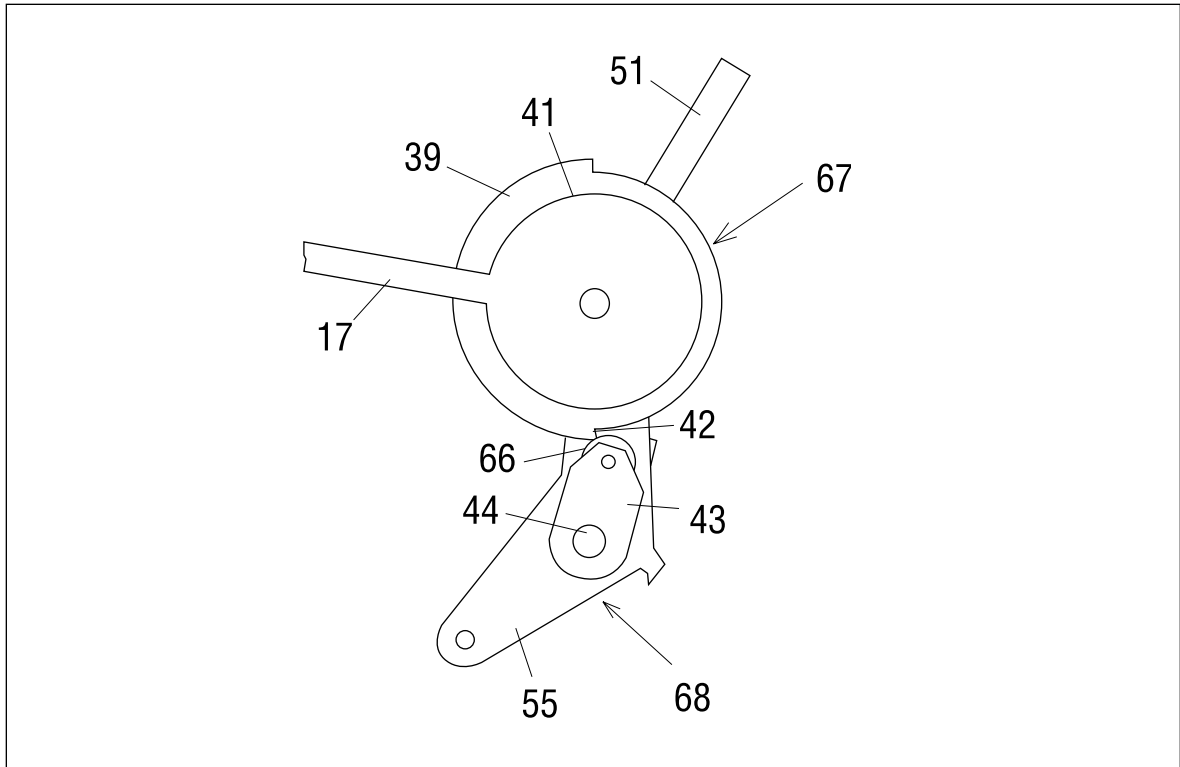


Illustration 8.19—Arrows to Designate Groups of Parts

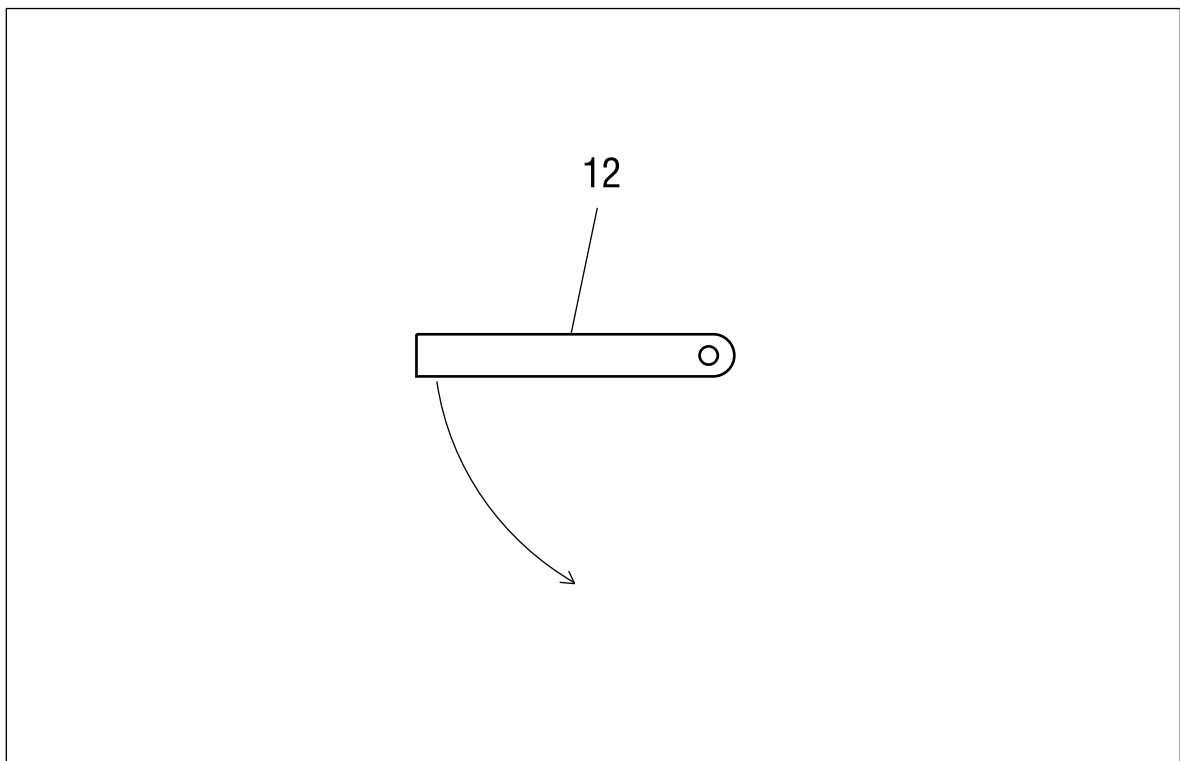


Illustration 8.20—Arrow to Indicate Movement

Line Types

Allowable line types are shown in Illustration 8.21.

Solid Line. Use this for edge lines and shading lines.

Hidden Line (Dashed). Sometimes it is necessary to show a part hidden behind other parts. Such hidden parts are shown with dashed lines.

Phantom Line (Dash-Dot-Dot-Dash). A component that is not part of the invention may be shown in phantom lines. This is absolutely necessary in design patent drawings. Such a component may be shown in solid lines in utility patent drawings.

Projected Line (Dash-Dot-Dash). Projected lines may be used to show how separated objects fit together, although such lines are not usually necessary. The use of a projected line in an exploded view eliminates the need for a bracket. (See Chapter 6 for details on exploded views.)

Although technically there are different broken lines (hidden, phantom, and projected) for different applications, the dashed line may be used for any situation that requires a broken line.

Character of Lines

Except for color drawings and photographs, all drawings must be done in black lines. The lines must be thick enough to allow photocopying without loss of detail, although the thickness of lines may vary according to their roles in a drawing. All lines must be solid black, uniformly thick, and have sharp, smooth edges.



CAUTION

Common Errors: Lines that are not dense or black enough, are not uniformly thick throughout, are jagged, or have feathered edges, as shown in Illustration 8.22. These are by far the most common

errors found in patent drawings, and are typically made by using the wrong equipment—such as the wrong paper, pen, or computer printer—or by using an improper drafting technique. (See Chapters 2 and 3, on the proper equipment and techniques for making lines.)

Although all the lines in a drawing may be of the same width, the use of different widths for lines in different roles can greatly improve the legibility and aesthetics of a drawing. (See Chapters 6 and 7 for suggested line widths.)

Descriptive Legends

Descriptive text is permitted in a drawing only when it is absolutely necessary to identify a part or an element whose nature is not apparent from the drawing alone. One situation where it is actually required is within the boxes of flowcharts and block diagrams. Another situation where descriptive text should be used is to indicate a “special” element, such as labeling a container of liquid, “Acid.” (Flowcharts and block diagrams are discussed in Chapter 6.)

Scale of Drawing

The same object should be shown in different figures in the same size if possible. Each figure should be large enough so that all of its essential details are easily comprehensible. Use all of the available space on a sheet to make each figure as large as possible without crowding the figures. Use the whole sheet for a single figure if necessary, as in Illustration 8.23.



CAUTION

Common Error: Drawing the figures too small, so that the lines are too close together and the features are too small to be easily discerned, as in Illustration 8.24.

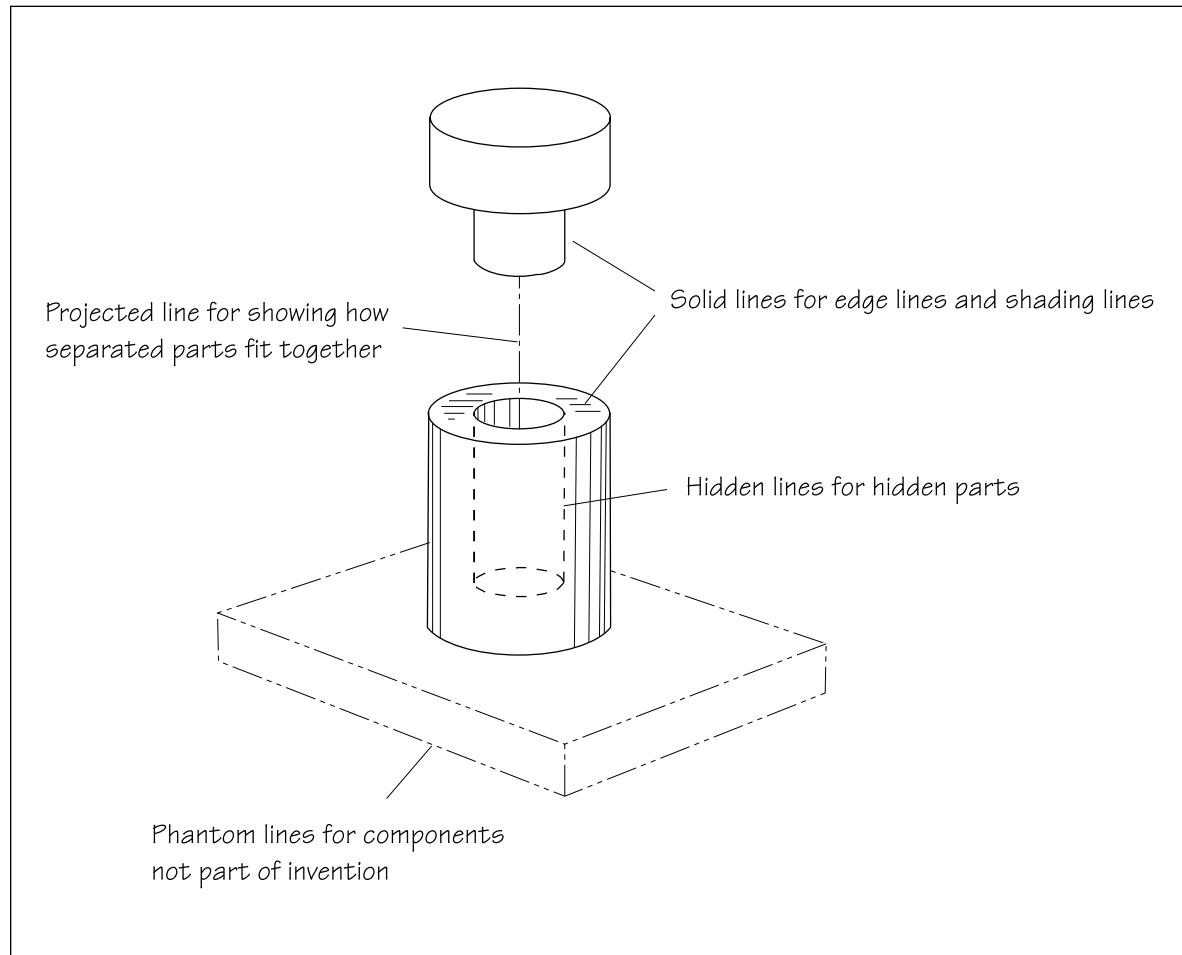


Illustration 8.21—Line Types

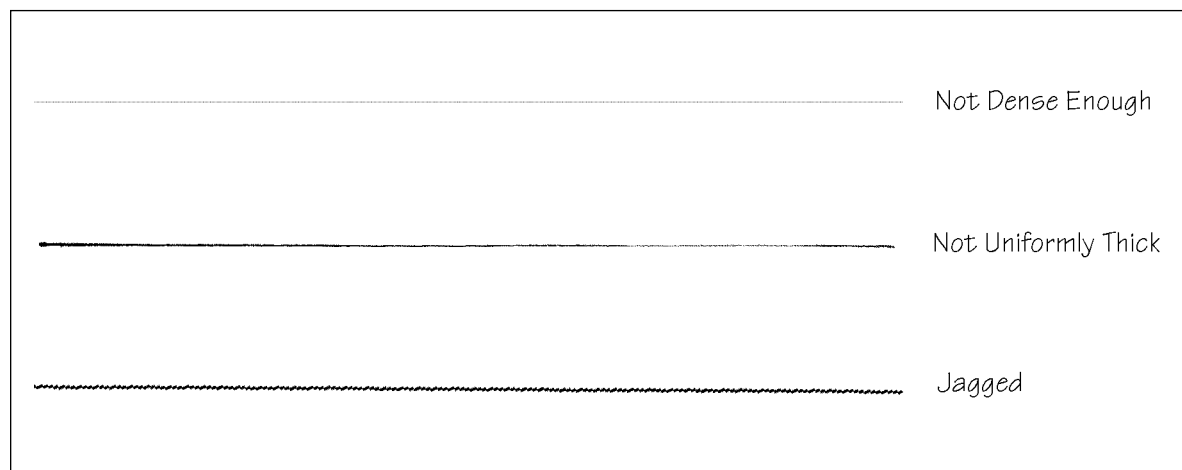


Illustration 8.22—Poor Line Quality

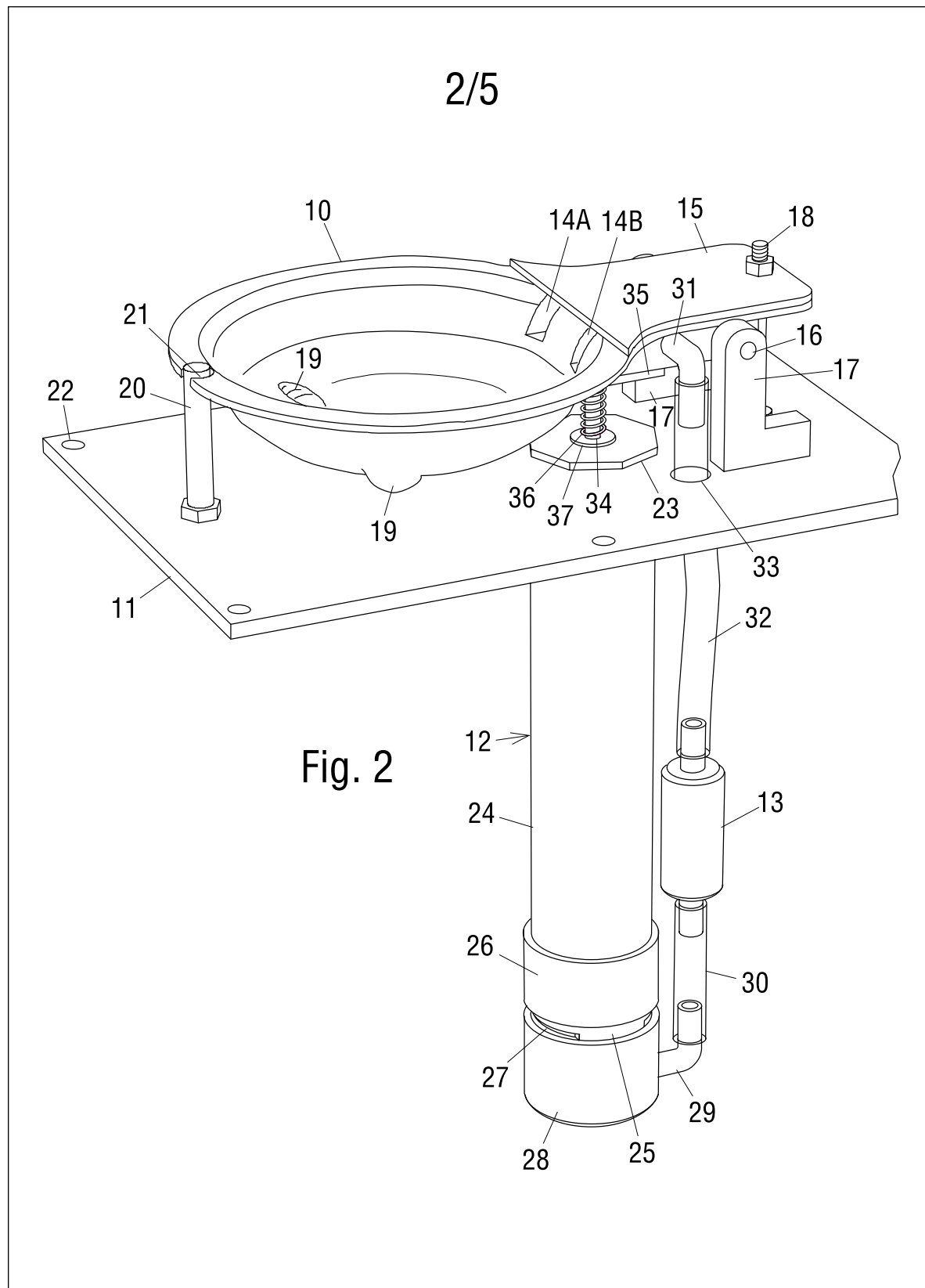


Illustration 8.23—Using Full Sheet to Show All Details

2/5

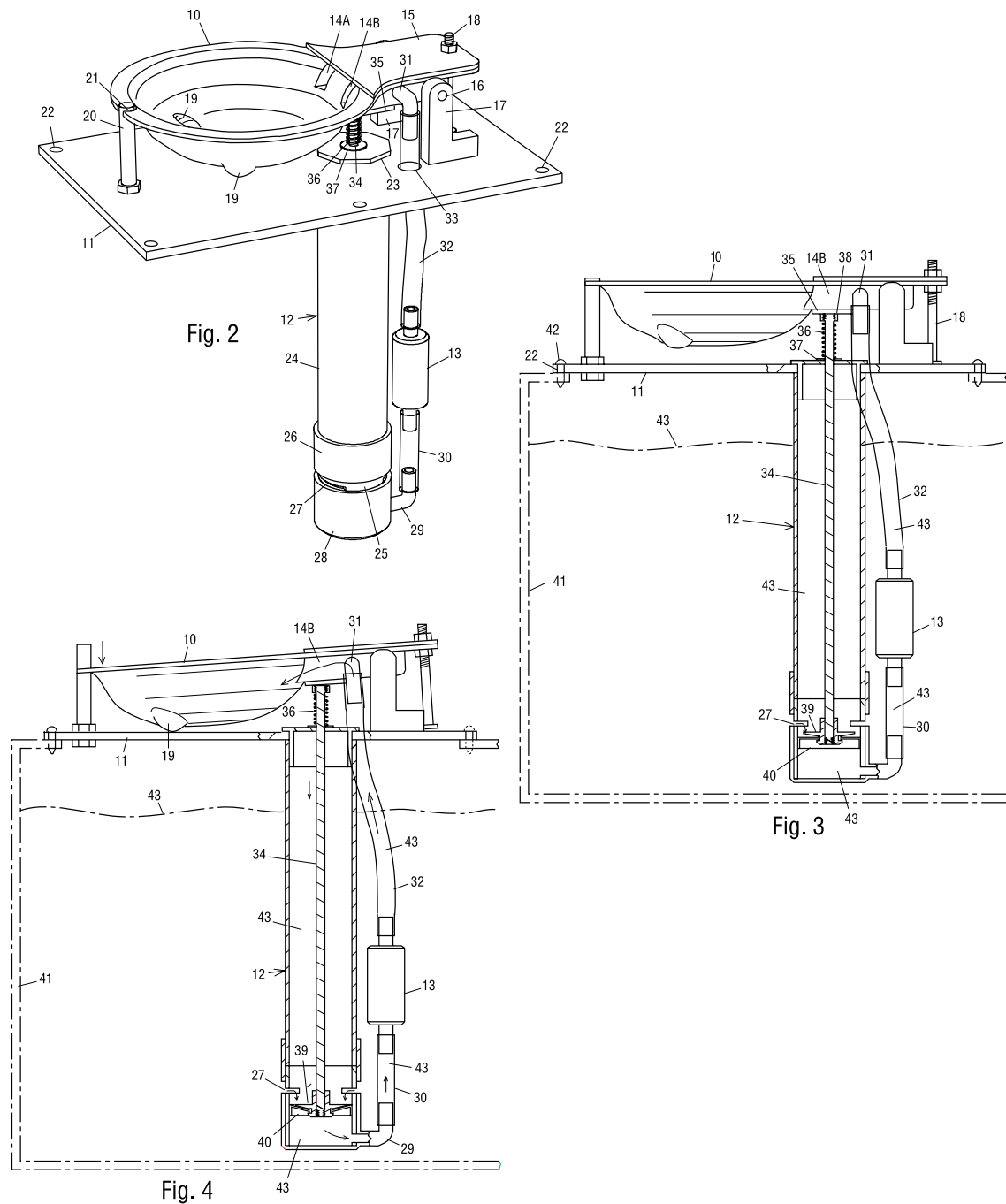


Illustration 8.24—Figures Too Small and Crowded

Do not hesitate to enlarge an object in a separate figure for clarity whenever it is necessary. If an object is shown substantially larger in a figure relative to another, the description (specification) should note the different scales to avoid confusion—for example, “mechanism 15 is shown enlarged in Fig. 3 for clarity.”

If only part of an object is enlarged in a separate figure, the part of interest should be indicated in the original figure by a dashed circle, as shown in Illustration 8.25, so as to indicate its location within the whole object. However, the PTO rarely objects to the lack of such a dashed circle. Different figure numbers must be used to designate the separate figures.

Copyright or Mask Work Notice


You may be able to obtain a copyright as well as a utility patent for some inventions, notably objects with aesthetic features and functional parts. Refer to *Patent It Yourself*, Chapter 1, for more information on copyright.

If you are applying for a utility patent for an invention that is also covered by copyright, you may include a copyright notice in the patent drawing. Illustration 8.26 shows a wind vane that uses an electronic position encoder 12, and an ornamental, cat-shaped vane 13. The whole invention (a position encoder attached to a wind vane) may be covered by a utility patent, while the cat-shaped vane alone may be covered by copyright. The proper format of the copyright notice is “© year of copyright your name.” The following paragraph must be included at the beginning—preferably as the first paragraph—of the specification:

“A portion of the disclosure of this patent document contains material that is subject to copyright protection. The copyright owner has

no objection to the facsimile reproduction by anyone of the patent disclosure, as it appears in the Patent and Trademark Office patent files or records, but otherwise reserves all copyright rights whatsoever.”

The copyright notice must be placed below the copyrighted design within the margins—that is, within the sight—of the sheet. The font or lettering must be between 3.2 mm ($\frac{1}{8}$ " or 14 points) and 6.3 mm ($\frac{1}{4}$ " or 28 points) high.

A special category of copyright is known as a “mask work,” which is a mask used in the making of integrated circuits. If your invention is such a mask, substitute “mask work” for “copyright” in the above paragraph. The proper format for a mask work notice is “*M*,” “,” or “mask work” followed by your name—for example “*M* John Smith.”

If the shape of your invention is considered a trademark (brand name, brand symbol), such as the Fotomat huts in shopping center parking lots, it would be wise to indicate this in the specification (description)—for example, “The shape of building in Fig. 1 is applicant’s trademark for a photo finishing service.”

Security Markings

All applications filed in the PTO are screened for subject matter that might impact our national security. If you have invented, for example, a new doomsday weapon, and the PTO and other federal agencies determine that publicizing your invention by granting a patent will be detrimental to our national security, a secrecy order will be placed on your patent application. The PTO will notify you, and the grant of your patent will be withheld for as long as national security requires.

If your invention is subject to a secrecy order, or any other security classification (for

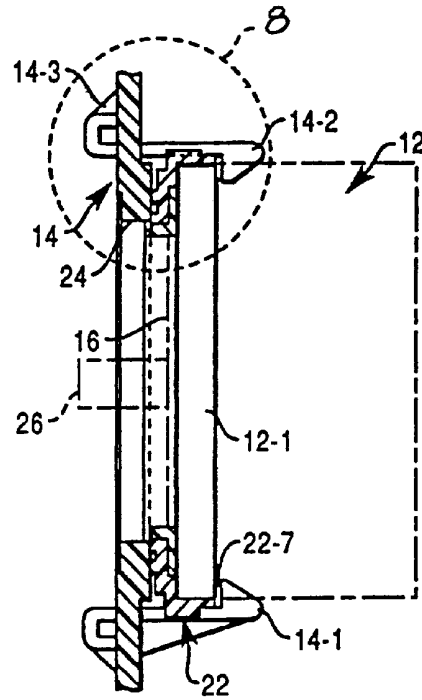
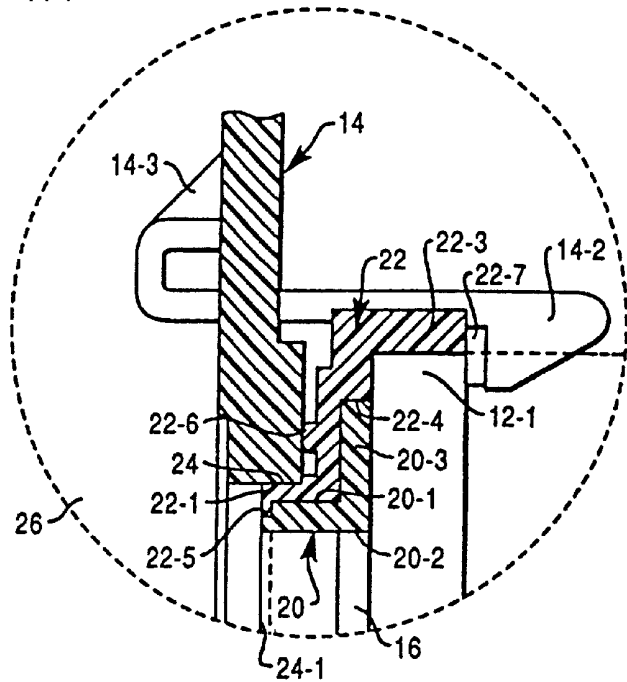
FIG. 7**FIG. 8**

Illustration 8.25—Enlarged Detail

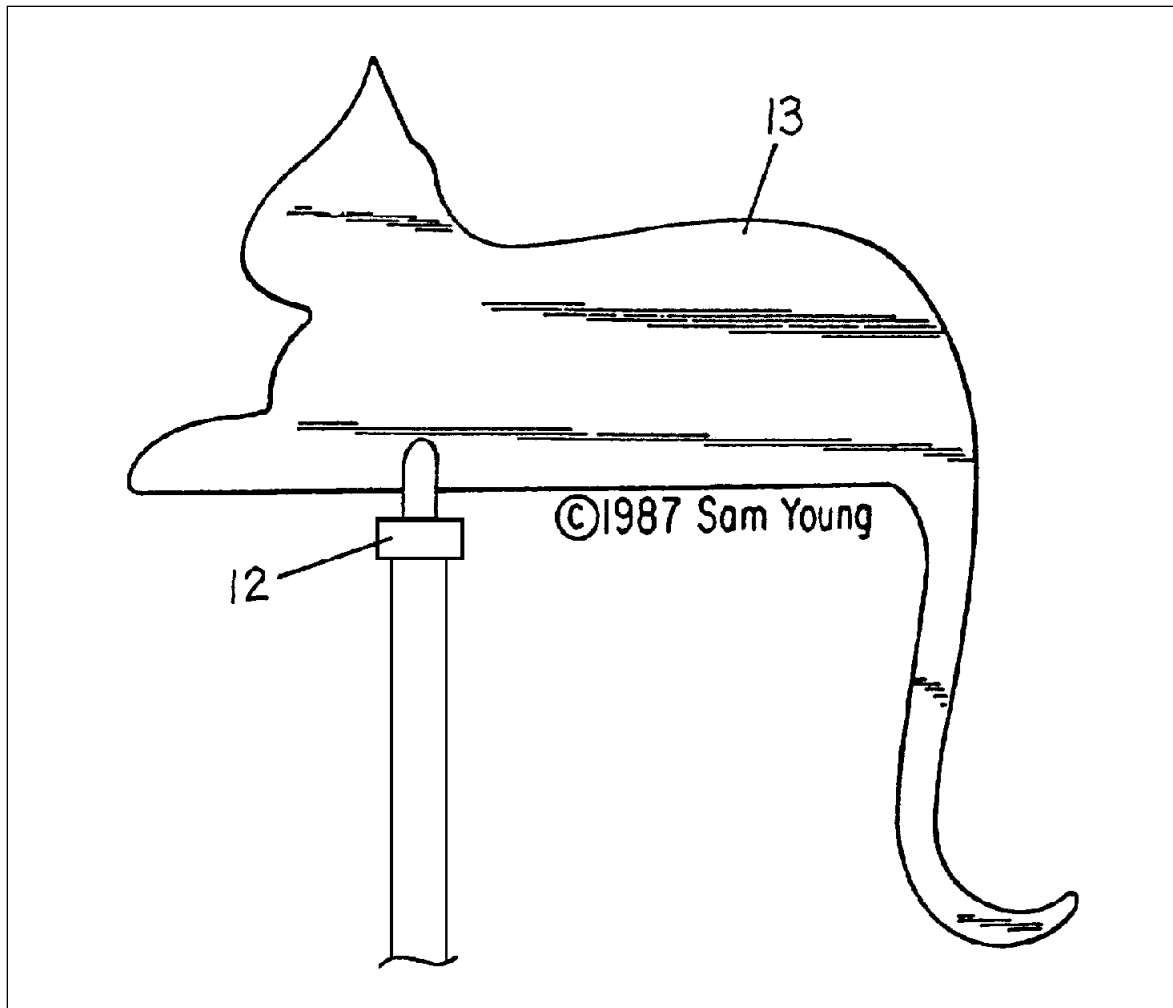


Illustration 8.26—Copyright Notice

example, you received a secrecy order from the PTO after its security review, or you are working under a government contract, which involves confidential, secret, top secret, or “Q” material), you may place authorized security markings—such as NATO (North Atlantic Treaty Organization), TS (top secret), S (secret), or C (confidential)—in the middle of the upper margin of a sheet, as shown in Illustration 8.27.

Corrections

Ink drawings may be corrected by erasure or white masking fluid, such as Wite-Out®, as long as erased lines are invisible and the masking fluid is durable, so that it will not crack or flake off. If you use an eraser, be careful when drawing new lines over erased areas, which may become roughened, causing the ink to bleed or feather. If you prefer a masking fluid, select one with a pen-type applicator and avoid those with brush applicators, which tend to dry out quickly and make application difficult. Note that white masking fluid dissolves some inks,

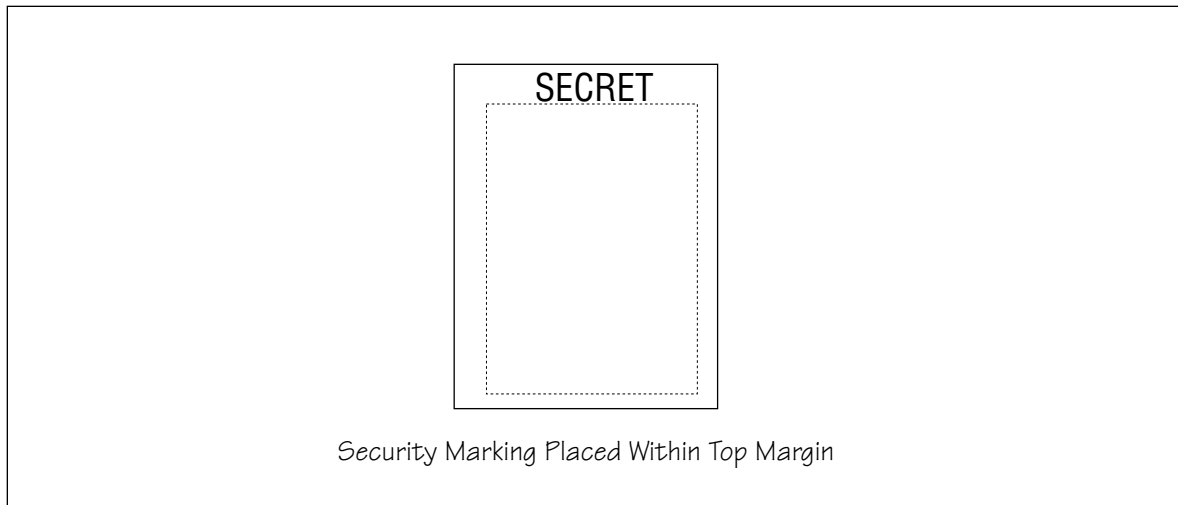


Illustration 8.27—Security Marking

which may darken the fluid. Such corrections are not acceptable.

Corrections to a drawing sheet can be avoided if the drawing is made with CAD: The drawing can be corrected on the computer, and a new sheet printed.

Prohibited Elements

The following elements cannot appear on patent drawings:

- indications regarding the scale of the figures, such as “Actual Size” and “Scale 1:2”. This is because the PTO often reduces drawings in size when printing them as part of a patent, so scale indications became inaccurate. Such indications should not appear in the description (specification) either.
- expressions or drawings contrary to morality or public order, such as explicit sexual and violent images (unless necessary to show the invention), or profanity
- trademarks or service marks, such as Coca Cola® or AT&T®, unless you prove that you have a proprietary interest in the mark
- any statement or other matter obviously irrelevant or unnecessary under the circumstances
- descriptive legends (text)—such as “Electrical diagram of widget,” “on/off switch,” and “serrated surface”—except one or a few words when such words are indispensable—for example, within the individual boxes of flowcharts and schematics
- center lines depicting the center or axis of circular parts. However, this rule is rarely enforced.
- brackets or circles surrounding reference numerals. Although not specifically prohibited, brackets should not surround reference numerals in the description (specification) either.
- any lines connecting separate figures (figures with different figure numbers), except for electrical waveforms
- solid black shading areas, except when used to represent bar graphs, or black color in drawings meant to depict color as a distinguishing feature of an invention, and

- artwork or figures that are covered by copyright, unless you prove that you have a proprietary interest in the mark.

Identification Information

Optional identification information may be placed on the front or back of each sheet. Although it is optional, such information may become useful if your drawings are separated from your file at the PTO. Such information should include the:

- title of invention
- name of inventor
- application serial number, and
- group art unit.

If on the back, the lettering must not show through on the front of the drawing, so write lightly with a pencil near the edge of each sheet, or print in light gray with a laser printer. If on the front, the lettering must be centered in the top margin. The third and fourth items are known only after the application has been filed and you have received a filing receipt, so they have to be used only when filing corrected

drawings, such as in response to Office Actions. (See Chapter 9 for details on filing corrected drawings.)

Drafting Symbols

In the past, the PTO provided examples of various drafting symbols to illustrate the way it preferred that patent drawings show materials in section, colors, and standard components. However, recent editions of the PTO Rules and guides have not contained these examples. We believe you will find these examples useful, so we are reproducing them here as follows: Illustration 8-28 shows Sectional and Nonsectional Views of Various Materials; Illustration 8-29 shows Electrical Symbols; and Illustration 8-30 shows Mechanical Symbols. Note, however, that some of these symbols are dated and symbols for some modern components are not included, so you may use any standard or descriptive symbols for any modern components that are not shown. Be sure always to number, identify, and describe every component in your specification.

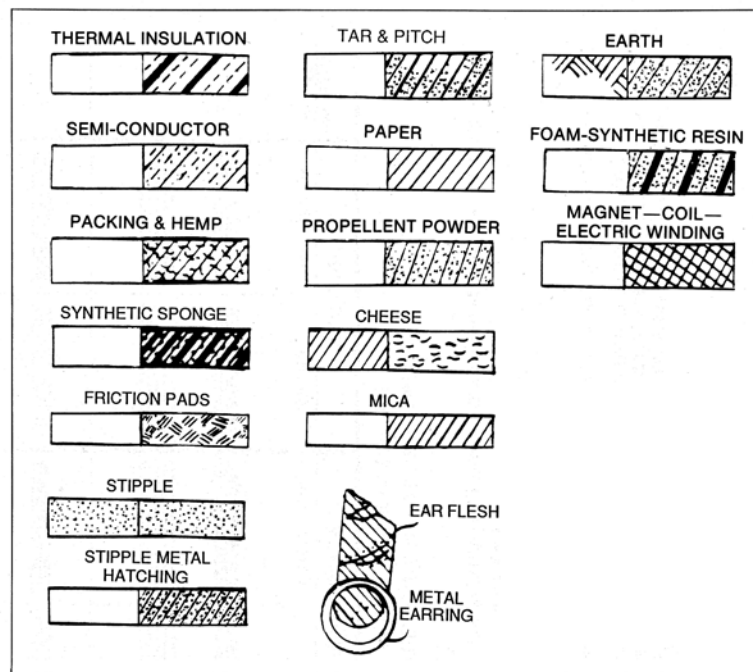
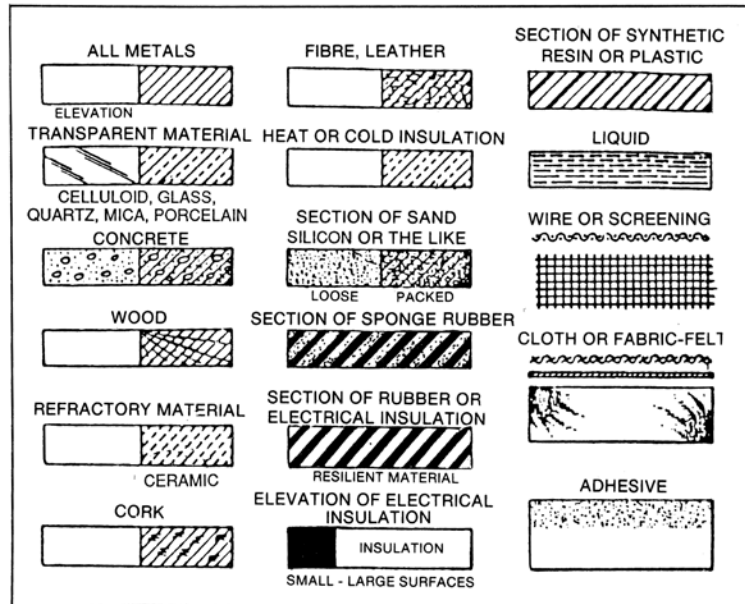


Illustration 8.28—Sectional and Nonsectional Views of Various Materials




















































































Electrical Symbols					
RESISTOR 	VARIABLE RESISTOR 	POTENTIOMETER 	RHEOSTATS 	CONDENSERS 	GANGED VARIABLE CONDENSERS 
INDUCTORS 	INDUCTOR ADJUSTABLE CORE 	INDUCTOR OR REACTOR POWDERED MAGNETIC CORE 	TRANSFORMER SATURABLE CORE 	TRANSFORMER AIR CORE 	VARIABLE TRANSFORMER 
TRANSFORMER MAGNETIC CORE 	AUTO-TRANSFORMER ADJUSTABLE 	CROSSED AND JOINED WIRES 	MAIN CIRCUITS 	FUSE 	COAXIAL CABLES 
SHIELDING 	BATTERY 	THERMOELEMENT 	BELL 	AMMETER 	MILLIAMMETER 
VOLTMETER 	GALVANOMETER 	WATTMETER 	SWITCH 	DOUBLE POLE SWITCH 	DOUBLE POLE DOUBLE THROW SWITCH 
PUSH BUTTON TWO POINT MAKE 	SELECTOR OR CONNECTOR OR FINDER SWITCH 	CIRCUIT BREAKER OVERLOAD 	RELAY 	POLARIZED RELAY 	DIFFERENTIAL RELAY 
ANNUNCIATORS SIDE 	DROP ANNUNCIATOR 	DRUM TYPE SWITCH OR CONTROL 	COMMUTATOR MOTOR OR GENERATOR 	REPULSION MOTOR 	INDUCTION MOTOR THREE PHASE SQUIRREL CAGE 
INDUCTION MOTOR PHASE WOUND SECONDARY 	SYNCHRONOUS MOTOR OR GEN. THREE PHASE 	MOTOR GENERATOR 	ROTARY CONVERTER THREE PHASE 	FREQUENCY CHANGER THREE PHASE 	TROLLEYS 
THIRD RAIL SHOE 	RECEIVERS 	TRANSMITTER OR MICROPHONE 	TELEPHONE HOOK 	TELEGRAPH KEY 	SWITCH BOARD PLUG AND JACK 
PHONOGRAPH PICK UP 	DYNAMIC SPEAKER 	ANTENNA 	LOOP ANTENNA 	GROUND 	SPARK GAP 
LIGHTNING ARRESTER 	DETECTOR OR RECTIFIER ANODE CATHODE 	DETECTOR OR RECTIFIER ANODE CATHODE CRYSTAL 	PIEZOELECTRIC CRYSTAL 	INCANDESCENT LAMP 	MERCURY ARC RECTIFIER 
ENVELOPE GAS FILLED 	DIODE 	TRIODE 	PENTODE INDIRECTLY HEATED CATHODE 	TRANSISTOR EMITTER COLLECTOR BASE 	TRANSISTOR EMITTER COLLECTOR BASE 
TRANSISTOR JUNCTION TYPE 	TRANSISTOR JUNCTION TYPE 	AMPLIFIER 	THERMIONIC FULL WAVE RECTIFIER 	FULL WAVE RECTIFIER GAS FILLED 	PHOTOELECTRIC CELL 
GLOW DISCHARGE TUBE 	X-RAY TUBE 	CATHODE RAY TUBE 	SPOT WELDING 	DEPOSIT WELDING 	

Illustration 8.29—Electrical Symbols

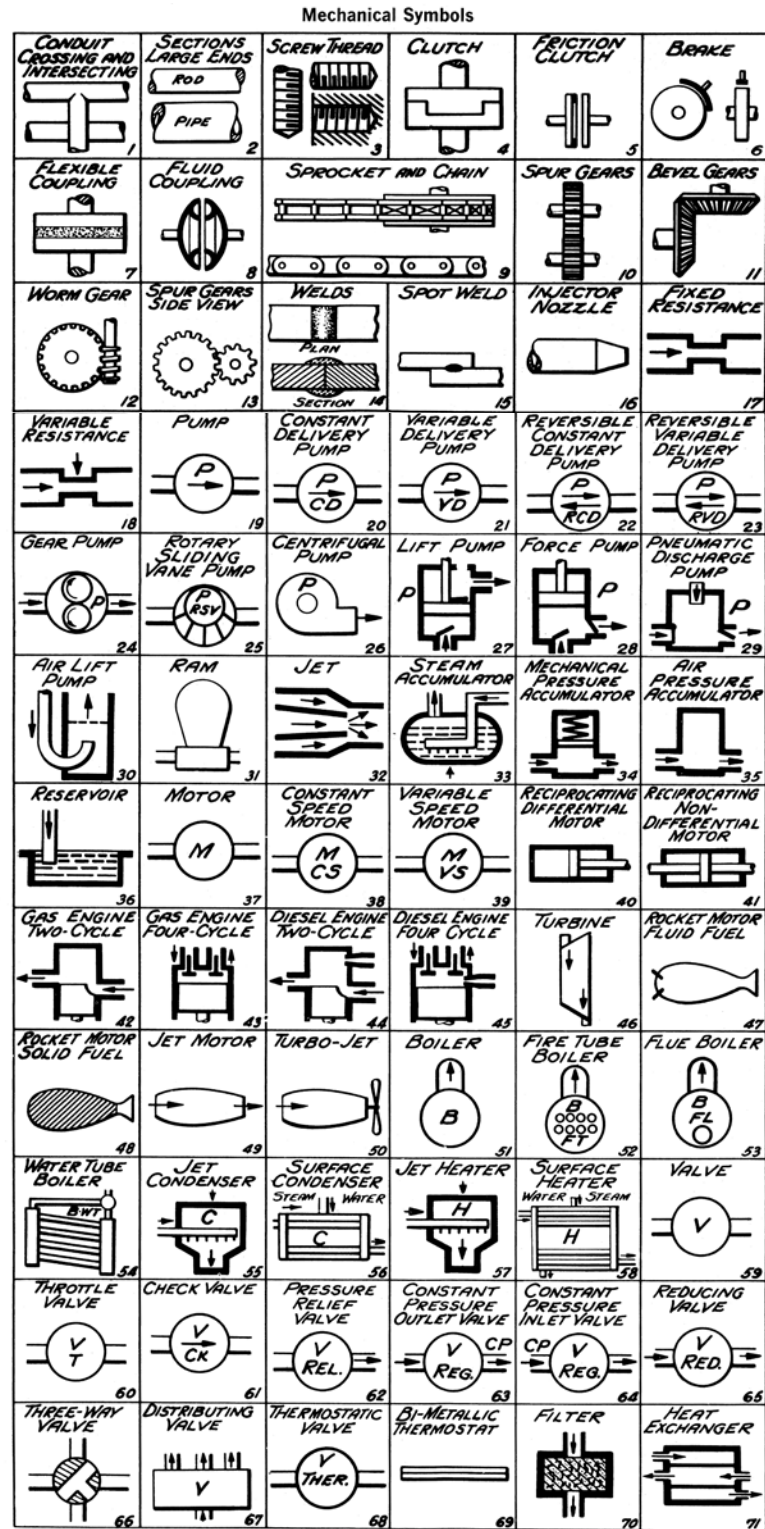


Illustration 8.30—Mechanical Symbols

